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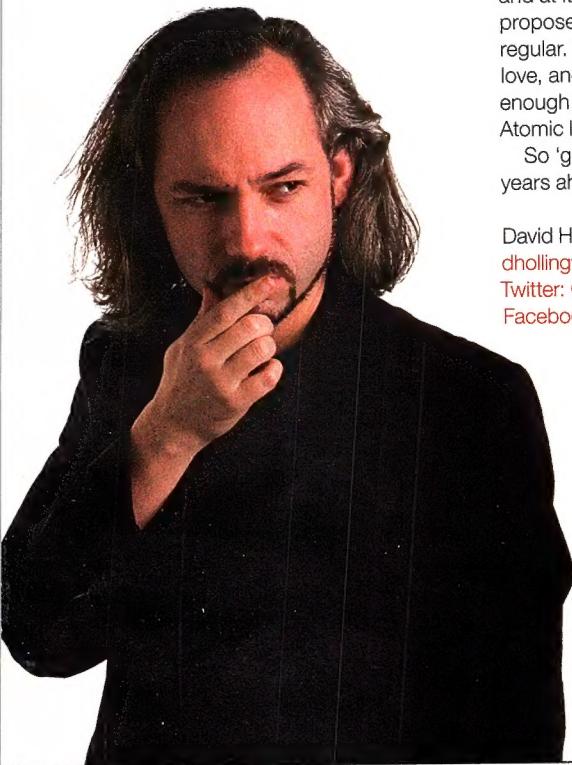
Atomic is love.

Love? Really, Dave?

Yes, we're not kidding. Love really is at the heart of absolutely everything we do here at Atomic.

We love PCs, every bolt and screw. We love getting great new gear and discovering the limits of performance; finding the sweet bit of new tech that makes even us think it might be time to upgrade. Case in point – the new GTX 460 from MSI on page 41.

Great card, overclocks well, and it's got Justin thinking it might be the next card for him – or, more accurately, two of them might be the next cards for him.



And then there's the Atomic Beast, on page 20. That's a mighty labour of love if ever I've seen one – and a mighty machine, too! But it takes heart and passion to build and fine tune a machine like that – it's no mere casual commitment.

I've had a bit of love myself, too. Mafia II may not be a perfect game, but is a great one, and I loved its unapologetic gangster tale. And who wouldn't love attending the biggest games show in Europe to play pre-release versions of hot new games?

But the love I'm referring to isn't in the magazine this month.

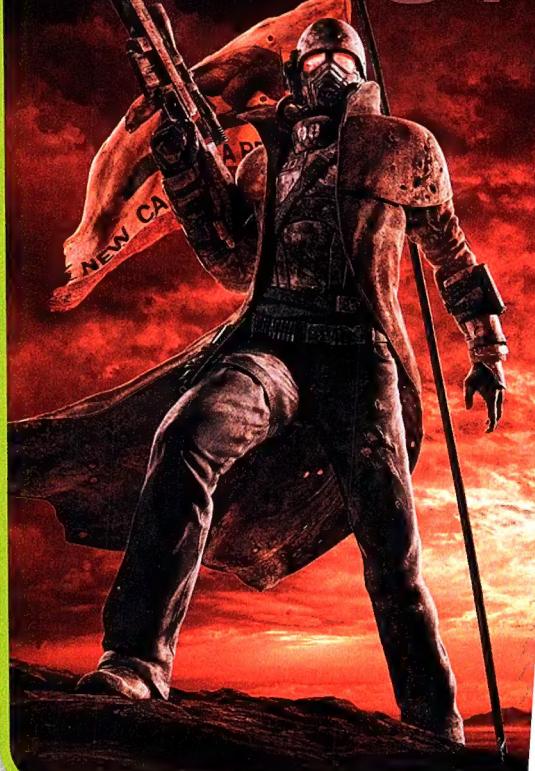
Atomic Meet X happened in August, and at it forum stalwart *Juggalo Scrub* proposed to *CheekyChops*, another forum regular. The two met on our forums, fell in love, and, now they're getting married. It's enough to make you a bit misty – it's a true Atomic love story.

So 'grats to you both, and many happy years ahead.

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 ISSUE

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atomicCREW

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Editorial and product submissions: Atomic welcomes all information on new and upgraded products and services for possible editorial coverage. However, we respectfully point out that the magazine is not obliged to either review or return unsolicited products. The Editor welcomes ideas for articles, preferably sent in outline form, with details of the author's background and a few samples of previously published work.

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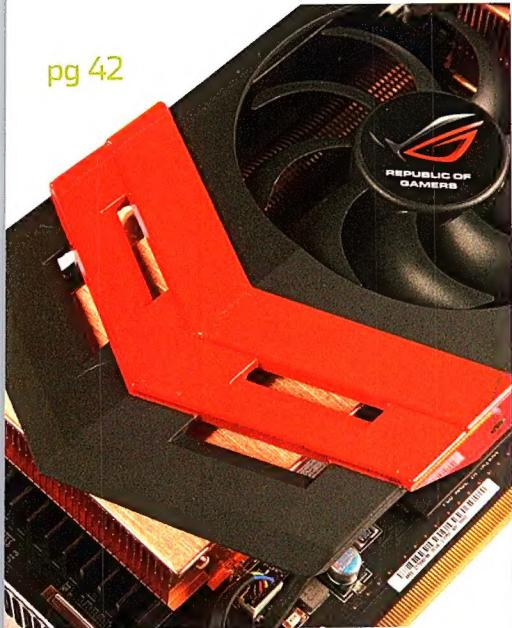


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New Neverwinter RPG coming in 2011

Good news for fans of Dungeons and Dragons on their PCs – a new Neverwinter RPG is coming in 2011.

Atari is teaming up with veteran MMO maker Cryptic Studios to deliver a new Neverwinter (not nights, just Neverwinter) RPG for PC next year. The game's going to be 'inspired' by the upcoming series from Forgotten Realms writer, RA Salvatore, creator of the beloved (and since endlessly copied) character Drizzt do-Urden.

"We're beyond thrilled to develop a brand new version of Neverwinter. It's been years since the original became a gaming icon and we're honored to work with such a great franchise," said Jack Emmert, Cryptic Studios' COO. "We've been working closely with Wizards of the Coast and R.A. Salvatore to create an authentic D&D adventure filled with compelling fiction and exciting gameplay."

The new game is set in Neverwinter City, of course, though the city's in a power vacuum following years of upheaval (probably player character related). Players will be able to choose from five classic D&D classes, and the game's based around the classic five-player party system. Players will be able to choose computer-controlled comrades, or hook up with other players online for full co-op play.

The game will also ship with a player-content generation system, so far tentatively titled Forge.

Neverwinter's set to ship in the fourth quarter of next year, and will be a PC exclusive. The new book from RA Salvatore, *Gauntlet*, will be out this October, and previews events from the game.

Rambus and NVIDIA memory duel finally ends

The epic battle over NVIDIA memory tech has finally concluded; Rambus granted another long-expected victory and a chunk of NVIDIA cash.

Rambus, manufacturer and designer of the now-ancient RDRAM sticks, have settled their case against NVIDIA after two years.

As we reported in 2008, the company was after "injunctive relief barring the infringement, contributory infringement, and inducement to infringe the Rambus patents, as well as monetary damages".

The settlement is based on a royalty scheme, so instead of a lump sum of cash, NVIDIA will give a percentage of sales to Rambus.

As explained in the press release: "Rambus has granted NVIDIA a patent

licence for certain memory controllers at a one percent royalty rate for SDR memory controllers and a two percent royalty rate for other memory controllers, including DDR, DDR2, DDR3, LPDDR, LPDDR2, GDDR2, GDDR3, GDDR4, and portions of GDDR5 memory controllers."

Rambus are infamously known as a patent troll in the semiconductor industry, and have sued practically every manufacturer of flash chips under the sun – most recent being Samsung Electronics, who must pay Rambus \$900 million in instalments by 2015.



FROM ATOMIC ONLINE

Wow – what a month.

We've had a record number of nominations this month, both found by us and referred to the mods by other users. So before we go on to celebrate this month's winner – good work guys! It's wonderful to see so much seriously good content ramping up on the forums :)

And now... winner time! This month, our lucky Atomican-of-the-month will receive a Razer Lycosa keyboard, too, for the cool typing up of hopefully many more awesome posts to come.

But who gets it? Who... reigns supreme? Newcomer *prefect_x*, for his excellent and fiendishly in-depth investigation into Nvidia's CUDA and how it performs in audio tasks. Want Atomic dedication – this post has it in spades.

<http://forums.atomicmpc.com.au/index.php?showtopic=34775>

And, of course, we have runners up:

Antraman delivers an excellent look at PC/home integration.

<http://forums.atomicmpc.com.au/index.php?showtopic=34697&st=0#entry697677>

Frizzl asks some interesting questions of Xbox's GOLD service.

<http://forums.atomicmpc.com.au/index.php?showtopic=34417>

Chancellor gets the ball rolling on an awesome photography thread.

<http://forums.atomicmpc.com.au/index.php?showtopic=34887&st=0&p=701258#entry701258>

Lovely work as always, my fine Atomicans. Next month we'll be giving away a shiny new Razer Banshee SCII headset, so keep those hotter than hot posts coming.



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Logitech HD Pro Webcam C190

Price: \$149 Website: www.logitech.com.au

There's a web celebrity inside all of us, just waiting to get out and set the innertubes alight with our dazzling wit and sparkling personality. Now, thanks to Logitech's new range of HD webcams, every single gorgeous and fame-worthy pore on our faces can be brilliantly displayed in 1080p glory.

Yes, this webcam is your ticket to fame and fortune*. It even comes bundled with software to help you edit your masterpiece and the ability to get the finished product onto Facebook or YouTube with one click (which, when we stop and think about it, sounds kind of dangerous), and it looks much friendlier than your run-of-the-mill webcam, so you'll be ranting at it comfortably within minutes of set-up. Fame couldn't be easier!

*fortune not guaranteed

LG BX580 3D Blu-ray player

Price: \$379 Website: www.lg.com/au

Every month, we sit here in the Atomic offices swearing that 3D is just a fad and nothing to get too excited about. And every month we get word of another major vendor releasing a new 3D product. It's getting kind of scary, to be honest. What if we're wrong, like we were about Beta, and that other format that used to compete with Blu-ray?

LG's plunge into the 3D pool features Wi-fi and a Common Interest File System (CIFS, if you need another pointless anagram in your life, or the ability to play content from your PC, if you don't). And if none of that excites and you're not convinced about 3D either, LG are also quick to assure us that the BX580 is just as effective in 2D. PHEW!



Blu-ray
3D

HELLO

Samsung SP-H03 pico projector

Price: \$399 Website: www.samsung.com.au

We're not actually sold on projectors – they seem like a great idea, until you have to find a spacious piece of blank white wall, in a room that is both big and able to be made dark enough to make it worth the effort. One day, we might be able to afford a house with a dedicated home cinema, but until then, we might hold off.

All that said, this portable projector is kind of appealing. Being able say 'What? You've never seen Blade Runner? Well then, look at that wall!' in the midst of a pub argument just seems way too cool to turn down. Sure, it would be noisy and the wall probably not sufficiently blank and white, but we can dream...



X-Mini II

Price: \$49 Website: www.x-mini.com

We here at Atomic are surprisingly susceptible to the effects of cute – and the X-mini II is cute. It's red and small and it's got a shiny bit and you can play with it, and it even plays music, if you ask it nicely!

What you think of the quality of that music will mostly depend on your expectations. Get them low enough and you'll be fine – if you're as dubious as we were, you might even be pleasantly surprised. It's not going to produce any sort of thumping bass or pick out the minute details of Beethoven's 5th, but it is probably a step up from the inbuilt speaker in your phone.

Just cuter and shinier.



Sennheiser PX 200-III

Price: \$199 Website: www.sennheiser.com.au

Fashion is so cyclical. Remember when iPods first hit, and you could pick out the cool kids in the crowd by their white earbuds? And then everyone jumped on the bandwagon and the cool kids decided that while their iPod was great, they could get better sound and more street cred from a good old black set of 'phones? And Apple got all upset and invented the iPhone and put a microphone into the white earbuds, so the cool kids had to wear them again?

Well, now Sennheiser has upset the proverbial applecart once more with a new range of earbuds and headphones with in-line microphones, created just for iPhone. The PX 200 III fold up nice and small, but don't let their size fool you: these things sound awesome.

Apple will not be pleased.





The sounds of surround

Jake Carroll listens in on a surprising new gaming audio technology.

From the moment we are born, we are gifted with audition, or the sense of hearing. The sense is classified as a mechanical interaction, because the effect is the result of vibrations through a medium, such as air, hitting the microscopic fibres in our ears and causing them to move. These motions have a frequency of between ~20 and ~21,000Hz; hence, this is the normal human perception of the very lowest and very highest frequency responses we can hear. This month, we're going to explore sound, 3D audio and, on a much more unusual level, the concept of psychoacoustics.

When you sit down in front of your flat panel TV for an evening of sensory stimulation, one of the key parts of the experience is the soundtrack and audio (and the associated confectionary). Disney pioneered ubiquitous surround sound technologies in 1940. The guineapig movie was *Fantasia*. Strangely, Walt Disney felt the movie could benefit from the same treatment Rimsky Korsakov gave 'Flight of the Bumblebee', where a bee could be heard darting all over the room. The experiment turned out to be an epic failure, and, as a result, the music was completely removed from *Fantasia*. True surround sound would follow later.

The initial technology platform for surround sound or 'Fantasound' was all in hardware, consisting of three audio channels running through 54 different speakers – all controlled by an audio engineer on the fly. Not much automation here. Unsurprisingly, it didn't really end up a commercial success. We reckon the

engineer probably either (a) fell asleep at the wheel or (b) died from over-exertion too often for the technology to get a foothold.

Surround creation techniques

There are three well-known techniques for the creation of surround sound stages:

Positional static multi-channel surround mixing

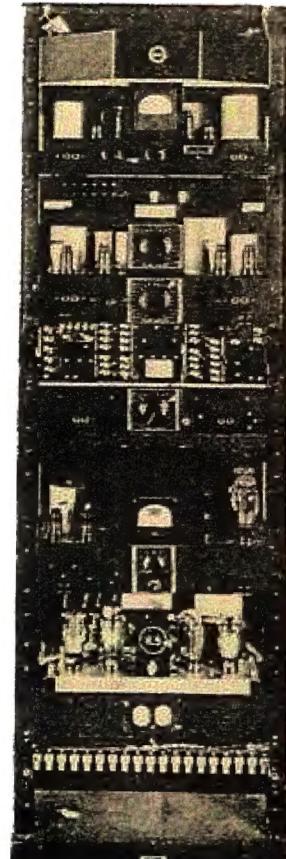
The first, and most commonly used in the music/movie industry for direct authoring to Blu-Ray, DVD, DVD-A and SACD is surround microphone and mixing. This simply involves recording all audio in segregated channels, then putting these sounds (encoded) through a mixing process that has them decode to specific speakers and channels only. The 5.1/7.1/9.1 speaker system encircles the listener, and they hear different audio through each channel in an absolute position.

Psychoacoustic sound localisation

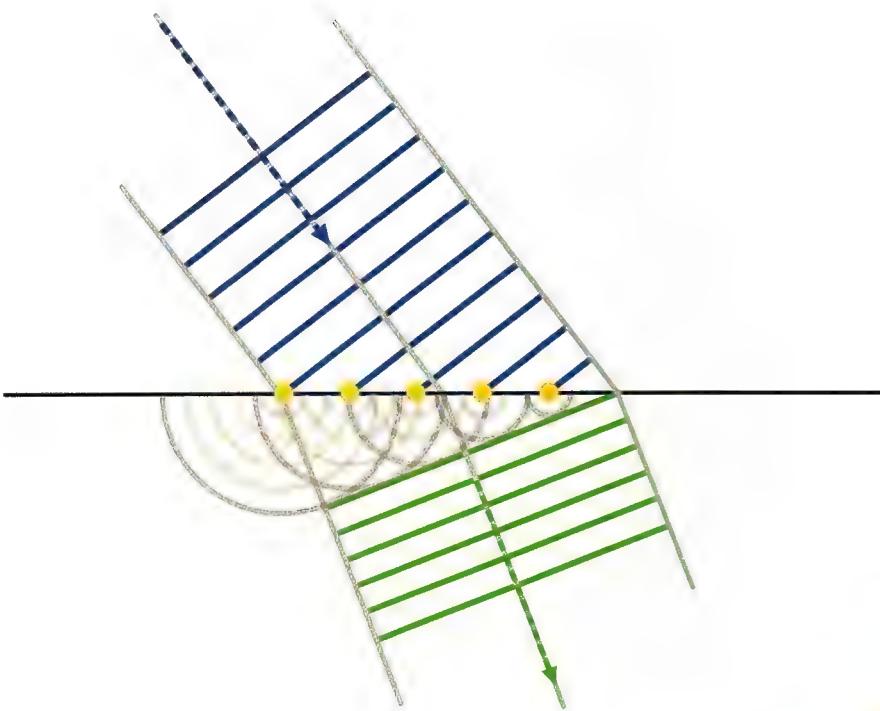
The second approach that is commonly utilised is to simulate two-dimensional planes using headphones. This is effectively a trick of the mind and auditory senses that will be explained in more depth later.

Huygens' Principle and Wave Field Synthesis (WFS)

A more complex concept that uses specific computation and positional rendering to effectively create an audio hologram. This technique of



The Fantasound control unit for all audio processing and signal outputs.



positioning audio is heavily reliant on wave refraction calculations and the principle that each point of an advancing wave front (and thus vibrations in the air) is in fact a fresh source of disturbance, and a new train of waves bouncing around at a different angle.

Making sense of sound

Sound is something that is perceived, is subjective and is as individual to each person as the hair follicles on our heads or the fingerprints on our fingers. Within this, engineering surround sound in the way we traditionally understand it

we've explained above, there is a grey area to all of this. Hearing isn't simply a mechanical phenomenon of wave propagation and deflection. It's also a sensory and perceptual event that stems from neural action potentials. It is the brain that understands and makes sense of these action potentials and electrical impulses that travel down our nerve paths.

A practical example of this is the now-ubiquitous compression codec from the Fraunhofer institute, MP3. It exploits the fact that our brain is implicit in hearing. The inner ear

Sound ... is subjective and is as individual to each person as the hair follicles on our heads or the fingerprints on our fingers.

isn't really an experience tailored to the individual. Multi-channel audio through 5.1/7.1/9.1 speakers does indeed have a significant impact and response in our ears. We 'hear' things from different parts of the room – but it doesn't hit the spot for all of us in exactly the same way. The reason for this is physiological. The shape of our ears, the size of our ear canal, the environment we are in, the place in which we were raised, the food we eat and the amount of sunlight we are exposed to all have an impact on the way we perceive sound, individually.

Psycho-aural

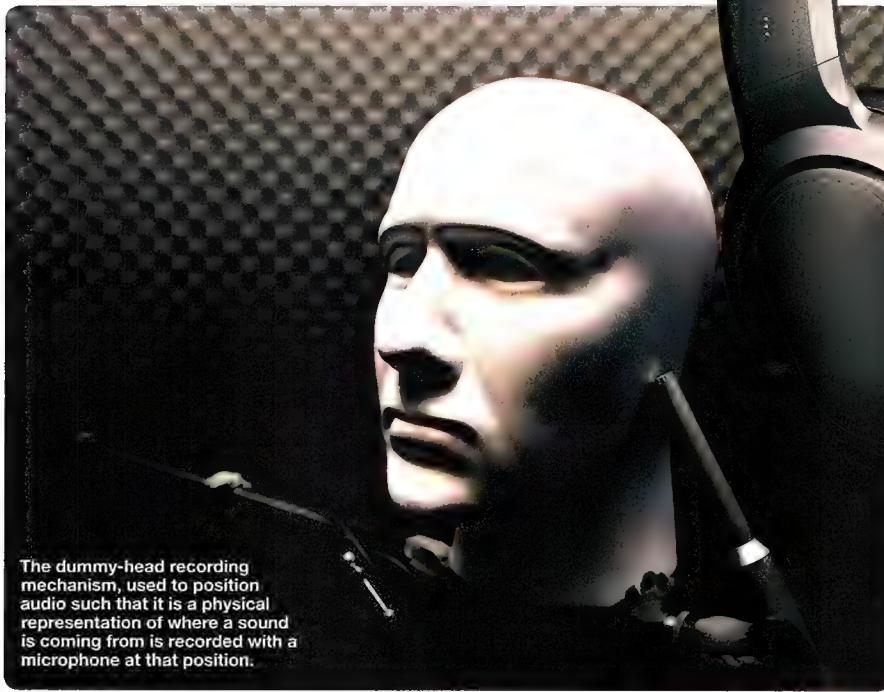
At this point, we delve into the odd, slightly squishy world of psychoacoustics. Despite what

carries out a significant amount of 'processing' before sending it through to the nerves for neural stimulus. As a result of this processing, plenty of what we hear might well be imperceptible. When MP3 blurs and dithers audio to approximate what was in the original source material, it relies on the fact that our inner ear processing mechanisms does a 'best guess' to fill in the blanks and inference what should actually be there in the original recording. The brain is more powerful than any

computing AI you can ever imagine.

One of the interesting facets of psychoacoustics and these implied or inference-based sounds are masking effects. At first, these effects seem obvious, but when the situation is examined more closely, it becomes unusual and hard to explain. In some situations, an ordinarily audible sound or effect can be completely masked by another. This might be as simple as a person talking at a bus stop to another person. If a loud vehicle drives by, the ability for the two people to hear each other might be lost. This occurs simply because any loud sound distorts our absolute threshold of hearing. It becomes far less obvious when weaker sounds emitted soon after the end of a loud sound are masked by the loud sound. There is even the possibility of a quieter sound (before louder sound) being masked due to our ability to perceive loud from quiet. This is known as temporal masking.





The dummy-head recording mechanism, used to position audio such that it is a physical representation of where a sound is coming from is recorded with a microphone at that position.



recording involves up to three microphones and in-ear microphone moulds that sit right in the ear.

These moulds in the ear exist to capture yet another complex psychoacoustic interaction known as Head Related Transfer Functions (HRTFs). When a user is listening to the real world, sound is obstructed and filtered by our outer ears before being processed by our brain to understand, as

explained earlier. As it turns out, the way a sound is ultimately represented and perceived is entirely dependent upon the shape of the ear and head. The HRTF embeds all the auditory cues and encoding that exist as a sound travels from its source (a speaker or something close to the

The missing fundamental is another trick of the ear, coupled with the mind. It can be heard when there is no actual or apparent source of a frequency. This occurs as a result of the brain interpreting repetitive patterns determined by the harmonics that are actually there, audible and present, then inserting things it guesses should be present, but aren't. This unusual phenomenon is used by many high end and niche audio manufacturers to enable their extremely expensive speakers, amplification and output drivers to produce notes that are lower in pitch and harmonic value than the hardware is actually capable of producing.

Hearing is believing

So this month, we're doing something different with X-Ray. We're going to actually look at a product that uses these unusual psychoacoustic tricks of the mind to enhance a user experience. The product in question is a technology from a small company, called Personal Audio, known as MyEars.

The idea behind MyEars is that a need exists to produce realistic surround sound for 3D gaming experiences when surround sound multichannel speaker systems are not practical or available. The product literature suggests that real surround sound fields can be produced using standard stereo headphones, with personalisation mechanisms and sound profiles for each individual listener. Conventional mechanisms used to generate these surround sound fields in stereo headphones are varied, with the most popular (and early) being binaural recordings. Oftentimes, these binaural recording techniques were confused with what is simply known as a stereo recording, where some parts of the source material were panned to the right of the listening device and others to the left.

As it turns out, the way a sound is ultimately represented and perceived is entirely dependent upon the shape of the ear and head.

Binaural recording is different in that, because of microphone and recording device positioning, it factors in different head-shadow blocking and natural ear spacing, as well as ITD's (inter-aural time differences) and ILD's (inter-aural level differences).

The actual recording setup for full binaural

ear-drum) to the ear. Part of the premise behind technologies such as MyEars, and others like it, is that the directional variation of the sound as it hits the listener's ears has an impact on the filter itself. MyEars exploits the fact that an HRTF is like a unique fingerprint, as every person's head and ear shape is in some way different, and as



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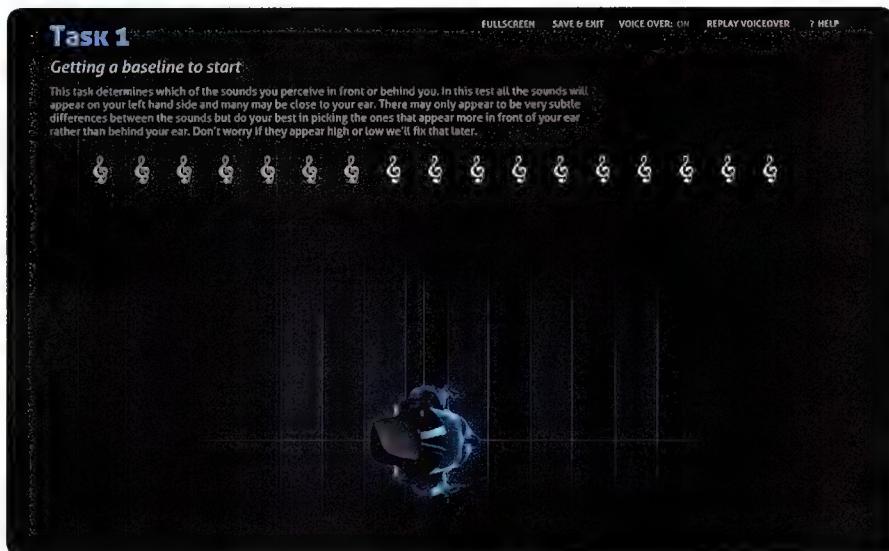
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The MyEars calibration mechanism distributes sound of different pitch, panning and intensity, making notes in the background about the characteristics of the user responses as they progress, thus building a personalised picture of how the users ears react to different patterns of audio.

a result, we perceive the directionality, frequency and intensity differently from every other being.

In the most traditional sense, a recording engineered to take advantage of HRTFs is manufactured using the same binaural techniques we mentioned earlier. The issues become apparent when trying to understand these HRTFs in the context of an individual listener measurement. Traditionally modelled and measured in a laboratory, the process is unwieldy and cannot be easily personalised

to an end user. Thusly, in many of the current generation measurement techniques 'back floating', mis-localisation, and panning/ripping issues are common. There are just too many factors and inputs to come up with satisfactory outputs for a unique, specific end user. The standing claim is that MyEars uses a far more precise individualised calculation mechanism, relying on the power of modern processing capabilities to do things with sound in real time that were previously unrealised. It remains to be seen if this product has the ultimate impact of a true multi point physical surround sound speaker system enclosed in a headphone HRTF.

Testing MyEars

We popped on a set of Sennheiser eH 350s and plugged into a Creative X-Fi Titanium HD output. We then pointed our browsers to <http://www.myears.net.au> and created a profile. We were treated to an interesting soothing voice from a robot that talked far too much, and then took us through a measurement and calibration process. We were tasked with the placement of what we could only describe as white noise snippets in different situations.

One of the components of the test we struggled to really complete with confidence was the baseline component, where the user must attempt to place the sound level with the ears to the side and in front of the face. This proves to be a common issue with many of the 3D audio analysis mechanisms that exist.

When the testing was over (it took us about 15 minutes, then we had another go and took another 15 to 20 mins to really try and get it 'right'), we loaded the profile the system had created for us into *Bioshock 2*. *Bioshock 1* and 2 were developed using the FMOD audio APIs, allowing for structure and engineering of 3D interactive environments. The API allows MyEars to plug the profile personally constructed directly into the audio renderer for the game.

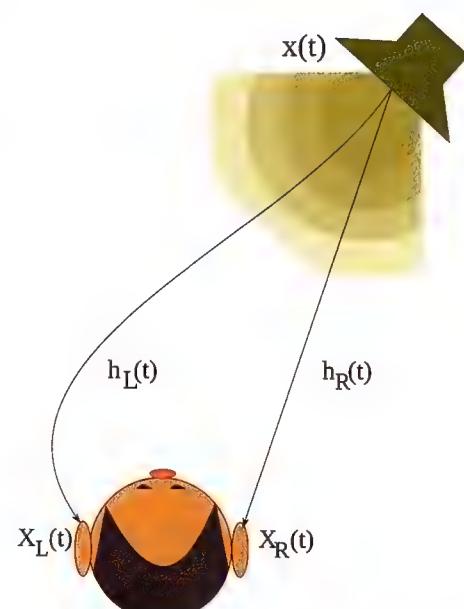
We fired up the in-game engine and started running around. Immediately, a few things were very clear:

- In terms of directionality and the sense of sound source positioning, it was obvious that MyEars was implying an effective HRTF on us.
- There was a more obvious sense of sound immersion than using a standard stereo/2.0 channel down mix into the headphones.
- The sense of depth and size of the environment was more obvious. It was a definite advantage in understanding from the game developers' perspective their intention of size in the game world.

We tested something typically problematic with environmental immersion systems, and stood near a waterfall to turn around near it. Our findings were that there was a distinctive 'break' or 'clip' between the panning of channel left to channel right. Up until that rear-panning point, the effect is very close to seamless and convincing. It is only that 'behind the ears' panning scenario that seems to detract from the HRTF that is imposed on our ears and minds.

In the end, we aren't entirely sure if this problematic behaviour can be rectified easily, nor are we sure if it's a physical impossibility to achieve. Ultimately, tricking the mind into thinking it is genuinely surrounded by audio is surprisingly effective, and we suggest that with time, research and processing power, it will become even more effective.

MyEars does a good job in being a brave new world concept leader. Maybe it's a sign of things to come.



The Head Related Transfer Function representation describes the filtering of a sound source ($x(t)$) before it is perceived at the left and right ears as $x_L(t)$ and $x_R(t)$.

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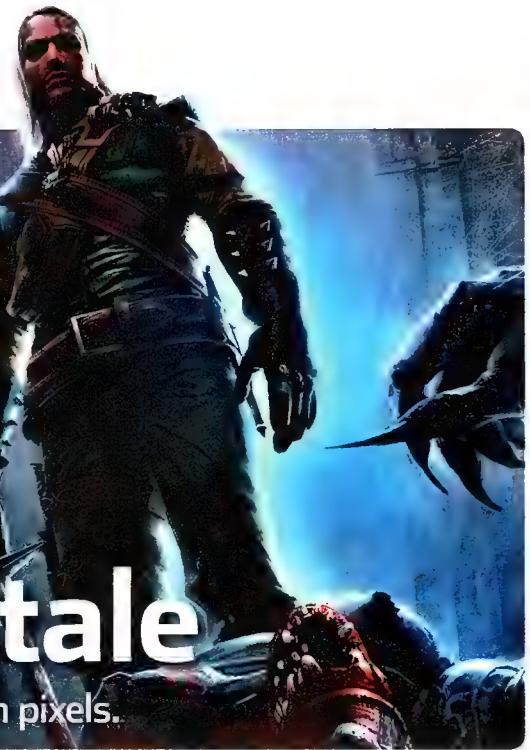
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The art of the tale

Ashton Mills thinks there's more to gaming than pixels.

I like to think games are evolving, and not just in the latest whizz-bang uber-engine of awesome awe way that we see with previews of games like *Crysis 2*. Yes, the move to ever-more realistic engines provides an even more engrossing, engaging experience – primarily for FPS games at least – but as even the most hardcore FPS fan knows a decent game is much more than engine alone.

It's also the story. And, for the most part, it's actually the most important component – though bizarrely this appears to be something many game developers haven't quite grasped.

The reason story is so important is simply that:

... it's often no surprise when a game bombs and you look under the hood to find a fiction that could be bettered by frolicking cats on a keyboard.

we live in stories. Our own, and that of others. Through entertainment on TV and in movies, and through books – life itself is a story.

No surprise then that games have stories too, and need them, because no matter how sexy and pretty an engine looks, you need a reason to be running around a planet shooting up the local wildlife. It's the story that validates your reason for being there; and it's the story that gives meaning to your successes. Games get very boring, very quickly, without a good story.

And not just background story, but an evolving narration that reflects your actions as you progress. Some games are very linear: there is just one way forward. And while that might sometimes sound boring, if done well a single option in your choices can be very rewarding. As long as it provides an emotional attachment to your actions.

If you think about your most favourite games, which ones do you remember the most? Those that had brilliant stories that rang true.

This is all kind of by-the-by common sense, or at least it should be – it's often no surprise when a game bombs and you look under the hood to find a fiction that could be bettered by frolicking cats on a keyboard.

What I'd like to see, in addition to evolution of the engines, is an evolution of the stories. To move gaming into a realm of free-flowing story interaction, and create a unique experience that's all your own.

This is done through choices, which many game stories have, but are often limited in scope.

(Which of course they need to be, it's rather hard to develop a completely open game world

emotional tug of attachment – is what so many games lack. It works for one simple reason: because sometimes that's what our choices are like in real-life.

Game evolution? The engines are nice, they really are, but ultimately they are and always have been the canvas for the story. It's time for investment into the writing, the plot, the narrative. Brandon Gray, of Box Office Mojo, a company which tracks film performance, responded recently to a growing backlash against 3D movies, saying of Hollywood studios "They all jumped on the 3D bandwagon but they're avoiding the real issue, which is their bankruptcy regarding storytelling."

I couldn't agree more and games, which tell stories just like movies, are no different. (P)

Ashton tells a pretty fine story himself...
amills@atomicmpc.com.au

where the story flexes depending what you do at any given time.)

Morrowind, *Oblivion* and *Fallout 3* do this reasonably well by breaking it up into a key story that can be completed in stages when the player is ready, but there are even more involving methods: allowing the player to alter the outcome of the story entirely.

I don't know if there are any others, but in my experience *The Witcher* has done this best to date. It's not so much that it has multiple choices for any given stage of the story, or even that some of these choices can alter how the game progresses in drastic ways from that choice to the end. It's that they were, often, damn hard choices to make. Some games give you black and white and say 'choose'. It's fun, but not really, because you know the outcome. But in *The Witcher* many choices were gray, and sometimes you had to choose between black and black. You actually felt torn about what you wanted to do and that – that moment, that





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INPUTOUTPUT

Dan Rutter brings the answers to your questions like no-one else can.

I/O OF THE MONTH

The perfectly obvious " " error

I I've got three hard drives in my computer, and one of them's going bad. Well, I think it is – not spinning up on startup, and/or not spinning up after Windows puts it to sleep. Result: frozen computer. Whatever the problem is, it's turned into a *bigger* problem now; I'm typing this on my netbook because my (Windows 7 Ultimate) PC now refuses to boot *at all*.

When I turn the PC on, it gives the normal single POST beep, and carries on until when Windows ought to start loading... and then it stops, at a black screen with a flashing grey cursor line in the top left corner.

I've been plugging and unplugging drives for a while now – booting from just C: with neither of the other drives plugged in, booting with only one of them plugged in, etc, trying to figure out which one had the problem (tried different plugs from the PSU and different SATA cables, too, to no effect). Now I'm afraid I've static-zapped C:, or bumped a head assembly out of alignment, or something.

Do you know what I've done?

Harnish Clibborn

O Yes, I reckon I do. The problem you have now is probably not associated with the dodgy drive. And this new problem, at least, is probably easy to fix.

What you've done, in plugging and unplugging drives and starting the system with different combinations of them, is change the order of your motherboard's drive list. So when you've got anything more than your boot drive plugged in, it's one of



WINS A THERMALTAKE CHALLENGER PRO KEYBOARD

the other drives that the computer's trying to boot from. Since neither of those drives has an operating system on it, you get The World's Least Informative Error™, that stupid black screen with the flashing cursor.

Go into BIOS setup, navigate to the drive-list, and rearrange it so that your boot drive is the first one. (This can be trickier than you'd think, if all of the drives are the same make and model and you have to identify them by which SATA port they're plugged into. Or you can just rearrange them blindly until it works.)

Next, go to the actual boot-order screen, and make sure 'hard disk', or the name of the drive you've put at the top of the drive-order list, is the first boot device, or second after the optical drive if you want the option of booting from CD/DVD. When your Windows drive is back at the top of the list, your computer should be no more broken than it was when you started. Which is more than can be said for a lot of situations like this.

(Different BIOSes do this stuff differently. You may find the boot-order and the drive-order all on the one setup page, for instance.)

```
Operating System not found.
NT kernel error 29A
HD servo tracks not found.
PSU electrical fire detected.
Erasing backups ... done!
Your death threat to the President of the USA has been sent.
To negate the above, wire $1,000,000 to Microsoft Corporation within the
next six <6> hours.
WE WILL KNOW if you just switch to Linux.
```

All I'm saying is, it could be worse.

Brainless NICs

I In dansdata.com/usbthings.htm, you write "USB network adapters are, by the way, likely to use more CPU power than even a basic PCI adapter, let alone a proper brand name server-quality NIC."

I do not know why basic and server-quality NICs would not be the same in CPU utilisation, and I would like to know. Can you point me to any information?

P

O This is the same deal as with many other pieces of hardware; processing has been moved from expensive logic in the device itself to the computer's CPU, via cheap driver software. Modems, printers, audio adapters and of course graphics adapters have all done this, though even entry-level modern graphics cards commonly have a lot of onboard acceleration hardware.

For network cards, you've got 'server-class' cards that, for instance, have a full TCP stack in hardware – a 'TCP Offload Engine'. 'Consumer-class' cards, in contrast, are quite dumb, with the driver doing most of the work. USB network adapters have even more software load because of USB's own overheads.

In pretty much all of these cases, though, the difference is no longer important for the vast majority of users, including 'enterprise' applications. People hated the old software-based 'Winmodems' because they only worked on Windows (their heavyweight drivers just hadn't been made for other OSes), and they were often buggy, and they imposed a significant CPU-usage load on the relatively slow computers of the time.

Today, doing full Ethernet – even *gigabit* Ethernet – largely in software will have a readily measurable effect on performance, if you're redlining the network bandwidth. But that effect is not one that the average user is likely to actually notice.

There are, for instance, those Bigfoot network cards specifically optimised to improve



I miss the old Bigfoot NICs with the giant pointy heat-sinks.

multiplayer game performance. But the improvement compared with a normal cheap PCI network card, even when the Killer NICs were brand new a few years ago, was very small. The difference between a Killer NIC and a server-class Intel NIC pretty much fades into the noise. (The purchase-price difference can be significant, though – unglamorous server hardware is commonly available cheap on eBay. Exotic ‘enthusiast’ PC hardware tends to hold its value irrationally well.)

Now that very fast multi-core CPUs are standard equipment for even low-end computers, you can do all sorts of outrageous crap in software without unacceptable performance penalties. RAID, emulation of other platforms, HD video playback, etc.

That said, if you’re building a PC to do some custom network-appliance job that requires umpteen NICs that all need to deliver some large fraction of their rated throughput all the time, you could very well need ‘proper’ network cards to get the job done. If it were me then I’d originally build the system with a bunch of cheap PCI/PCIe-x1 NICs and see if that was good enough, but other people’s mileage and tolerance for possible problems may of course differ.

DIY goop

 Toothpaste (dansdata.com/goop.htm) is an oldie but a goodie as a temporary thermal-paste solution.

What about Selleys Araldite (TM) as a fairly permanent solution? Lots of (ahem) old-timers swear by it.

Rocky

 Almost anything will work as a thermal interface material, if you don’t ask too much of it. If the mating surfaces are very flat and firmly clamped together, and if you don’t need to move a huge amount of heat through the junction, then any randomly-chosen gooey substance that won’t evaporate when heated for long periods of time will be adequate. This includes epoxy glue, but also dozens of other hardware-store substances, from axle grease to silicone sealant.

Most of those substances, definitely including epoxy, are quite lousy conductors of heat in absolute terms. If you apply them in the proper thermal-grease way – a very, very, translucently thin layer, if you’re connecting very flat surfaces – then they’ll pretty much only fill gaps that would otherwise be filled by very non-conductive air, and the net result

will be a small but worthwhile improvement.

If one or both of the surfaces are a bit uneven, though, a lot more of the heat load will have to move through your thermal compound, and low-conductivity compounds will become a problem. This situation is still very possible, even for modern CPUs and CPU coolers.

Too much goop between flat surfaces is bad, because it prevents direct contact. Too little goop between uneven surfaces is bad, because it leaves air spaces.

Also, the more energy you need to move through the junction, the more critical the goop becomes. All sorts of unlikely substances will work to connect a low-power netbook-type CPU to a full-sized heat-sink, but things change if you’re cooling a high-end multi-core chip, especially if it’s overclocked.

Even in that situation, the actual wattage transferred isn’t that amazing by normal engineering standards. Heat output of modern CPUs can now be way up in the hundreds of thousands of watts per square metre, but that die is only a few hundred square *millimetres* in size. But the maximum allowable temperature of a CPU is low enough to make thermal-transfer performance quite important.

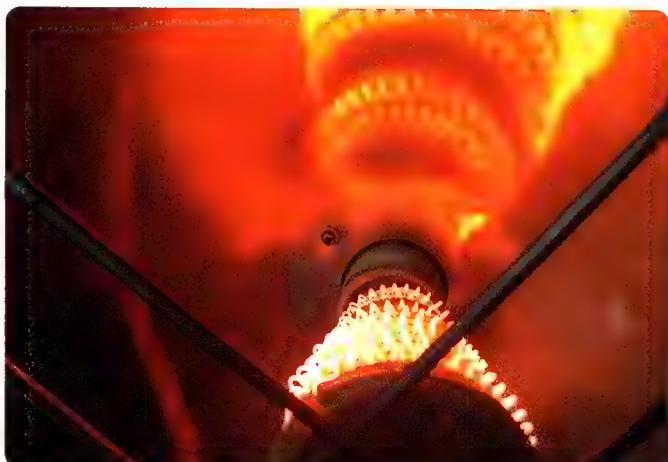
This said, you can whip up your own thermal goop by taking any ordinary light oil or glue and adding very conductive stuff to it, like superfine aluminium powder. Metal-filled epoxy – the big brand of which is that famous fixer of fuel tanks, engine blocks and B-52 wings, J-B Weld – makes pretty good thermal adhesive all by itself, provided you’re happy for that CPU and that heat-sink to remain mated for as long as they both shall live. (If you mix the epoxy with regular heat-sink grease, you can make a weaker glue that allows disassembly.)

It’s also now easy to get silicone-based thermal goop which is thin enough that most excess will slowly squeeze out the edges of the contact patch, so you can apply it a bit too heavily and let it find its own level. This is usually more than good enough for even high-end overclocked CPUs, provided case ventilation is also good and the ambient temperature isn’t outrageously high.

If you’re using thicker goop, or are just a perfectionist, you can get the compound-layer right by trial and error. Goop up the top of the CPU, install the cooler, uninstall it again, and see what the contact-patch on heat-sink and CPU now looks like. If it’s a fine web of goop with plenty of almost-clean metal showing, then unless the heat-sink’s got a very rough surface, you’ve probably used the right amount of goop. If you see no metal then there’s too much goop. If there are actual dry patches, then unless the mating surfaces are ultra-flat mirrors, you need more goop.

Don’t spend too long admiring your handiwork, though. One human hair or flake of dandruff can wedge the CPU and cooler apart far enough to significantly reduce heat transfer!

Benchmark Reviews’ eighty-way thermal-goop comparison (bit.ly/eightygoops) goes over a variety of different goop application techniques for different kinds of heat-sink. 



CPUs now output as much heat per unit area as many actual heating elements. Unfortunately, CPUs don’t work well when they’re glowing.



Building the Beast

What are the limits of modern desktop computing?

Justin Robinson pushes beyond the boundaries of sanity to find out.

The world of computing is truly incredible. From humble beginnings in 1971 and a revolutionary 4-bit processing chip, the single-core Intel 4004, processor speeds have increased in stratospheric leaps. In 2010, we have the guileless pleasure of the 64-bit hexa-core chip, the 980X – obliterating the Intel 4004's performance by many orders of magnitude.

Graphics processing became specialised enough by 1981 that cards such as the IBM MDA were released, each barely enough for monochrome 2D display work, and if you wanted a colour output you'd have to outlay a significant amount of cash. This year brings us the dual-GPU ATI 5970 and the single-GPU GTX480; not only able

to render in full colour, but in stereoscopic 3D too.

We often talk of technology in an aspirational tone within the pages of Atomic; as if high-performance computing is merely a goal to strive toward, a goal that we'll perhaps brush up against but never firmly grasp, leaving us trailing in the wake of a fast-moving industry. To that end we posed ourselves a challenge: get as much hardcore hardware in our greedy hands as possible, and then push that hardware to the very limits of stability. We're not talking about small overclocks here – nothing in the system will remain untouched. But are there drawbacks to a system that costs the same as a brand-new Hyundai Getz hatchback?

There's only one way to know for sure.

Beginning the Beast

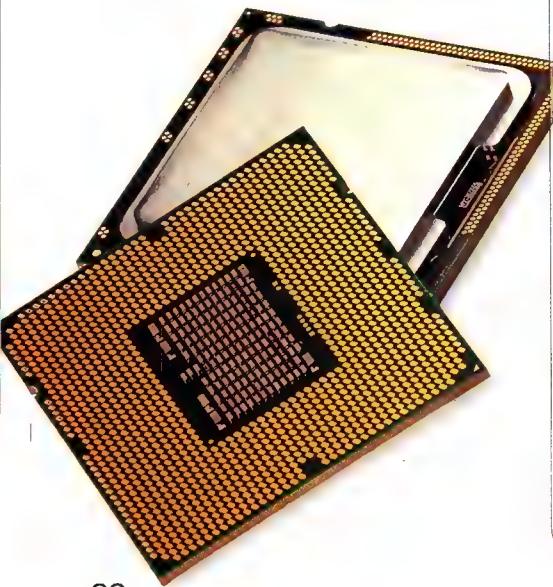
As any reasonably-informed computing enthusiast with a functioning index finger and internet access can tell you: merely going to an online store and choosing the most expensive of every component will get you an incredibly stupid list. Not only will the components probably not be compatible with each other, but in many cases they're old stock priced at the original listing.

Others still merely make ridiculous choices with the aim of producing an impressive price tag, picking unwieldy projectors, under-performing components and art-deco keyboards that fail to make a serious argument for their inclusion. We avoided these pitfalls in our component choice, and though our system is arguably still quite expensive, it is the only one in the entire world that can live up to its name: the Beast.

A heart as black as coal

There were a few restrictions we decided to place upon the Beast, but the largest is to go with air-cooling only.

Running within the Beast is an impressive array of tech, but perhaps none is as important as the motherboard. The EVGA SR-2 commands an impressive wallet-busting price of almost a thousand dollars, and this board offers a dual-socket processing capability that allows our second component choice to fit into place: two of Intel's superfast chips. It's also got enough PCIe bandwidth through the seven full-size slots to power four GTX480 cards, three from EVGA and one from ASUS, and boasts twelve DDR3 DIMM slots for up to 48GB of memory – without the additional expense of ECC memory – though we've gone with a slightly less excessive 20GB due to heatsink clearance and fan overhang problems. We also could not build this system into a case, as no case in Australia is large enough for the SR-2's ridiculously massive HPTX form factor (34.5cm



by 38.1cm); though the Corsair 800D comes very close.

In total, the two Xeon X5670 processors offer us twelve logical CPU cores and 24 threads, running at a stock frequency of 2.93GHz each, and each processor has access to 12MB of 'Smart Cache', a dynamically-shifting allotment that changes depending on the workload demands of each core.

Longer-term storage needs are fulfilled by two OCZ Vertex 2 SSDs, and the fastest SATA2 drives we've tested yet – two WD 600GB Velociraptors providing data and games storage. For the demanding movie buff we've also included an LG Super Multi BH10 Blu-ray

drive, able to playback 3D Blu-ray titles.

Cooling duties are performed by a duo of Noctua NH-U12DX-1366 heatsinks enflamed by twin Antec Tricool LED fans, supported by an additional six 120mm Noctua system fans. With all this tech running at full tilt and our somewhat-practical restriction of air cooling, we had hoped to power the Beast with a single Antec 1200W power supply – though this didn't quite turn out as planned.

For an easier breakdown of components, check out the 'Tech Specs at-a-glance' boxout. Atomic would also like to thank EVGA, ASUS, Intel, Altech, Western Digital, Noctua and LG for their help in sourcing parts for our Beast.

Challenge the Beast

We know that numbers are more exciting than unicorns adorned with glowstick-launching fireworks, but to increase their usefulness we've tailored our testing suite around easy-to-use benchmarks that are often free or otherwise very cheap. Atomic welcomes you to grab a copy and test your system's mettle against the Beast – to see how far behind the curve you lie... yeah - we went there!

Processor Benchmarks

PiFast (160KB): <http://pifast.hexus.net/pifast.php>

wPrime (783KB): <http://www.wprime.net/Download/>

Cinebench R10 (51MB): <http://tinyurl.com/CineR10>

Cinebench R11 (138.97MB): <http://tinyurl.com/CineR11>

Everest Ultimate 5.50 (9.78MB Trial): www.lavalys.com/support/downloads

Super Pi Mod 1.5 (60.4KB): <http://tinyurl.com/Supah-Pi>



Our graphic tests are somewhat less easy to grab, but only a few should take you as far as your wallet.

Graphic Benchmarks

3DMark Vantage 1.0.2 (414MB Trial): <http://tinyurl.com/3DVantage>

Crysis v1.2 patch (361.06MB, game required): <http://tinyurl.com/Cry-patch>

Unigine Heaven 2.1 (230.2MB): <http://tinyurl.com/UniHeav>

3DMark 06 1.2.0 (581MB): <http://tinyurl.com/3D06-Benc>



Fraught with peril

Aside from the emotional trauma involved from merely being near this much computing gear at one time, there are definitely a few problems we ran into while building the Beast, and prime among these challenges was the simple need for electricity. When you run two processors rated at 95W, four graphics cards at 250W each, another 40W of DDR3 memory, 17.6W for storage (13.6W of mechanical drives), not forgetting the motherboard – the Intel 5520 chipset draws 27.1W, with the NVIDIA NF200 adding another 20W – all on top of the 15W or so draw from cooling fans – you're looking at 1309.7W of power. *Before* overclocking.

A single 1200W was clearly not enough to power this rig, and though the Antec unit came with enough cables, it wasn't able to get everything off the ground. Instead we added in a second 1200W unit, powering it with the age-old 24-pin paperclip trick (<http://tinyurl.com/psu-clip>). The primary unit powered the motherboard, system drives, processors and the primary graphics card, while the secondary unit took control over the

remaining three cards, splitting the load between them.

The sheer weight of the components that were installed on the SR-2 was another serious problem, as the board would flex noticeably if we attempted to wrangle its hulking frame from below. Instead we simply lifted it by the heatsinks, though only once the graphics cards were removed. The build completed, we powered up the Beast and threw on a copy of Windows 7 Ultimate x64 for its dual-processor ability, and launched into testing.

Tech specs at-a-glance

2x Intel Xeon X5670, **\$3800**

EVGA Classified SR-2, **\$960**

10x Corsair CMG6GX3MA2000C8 sticks, **\$1600**

3x EVGA GTX480, **\$1995**

ASUS GTX480, **\$620**

2x OCZ Vertex 2 100GB, **\$1000**

2x Western Digital VelociRaptor 600GB, **\$800**

LG Super Multi BH10, **\$170**

2x Antec TruePower Quattro 1200W, **\$610**

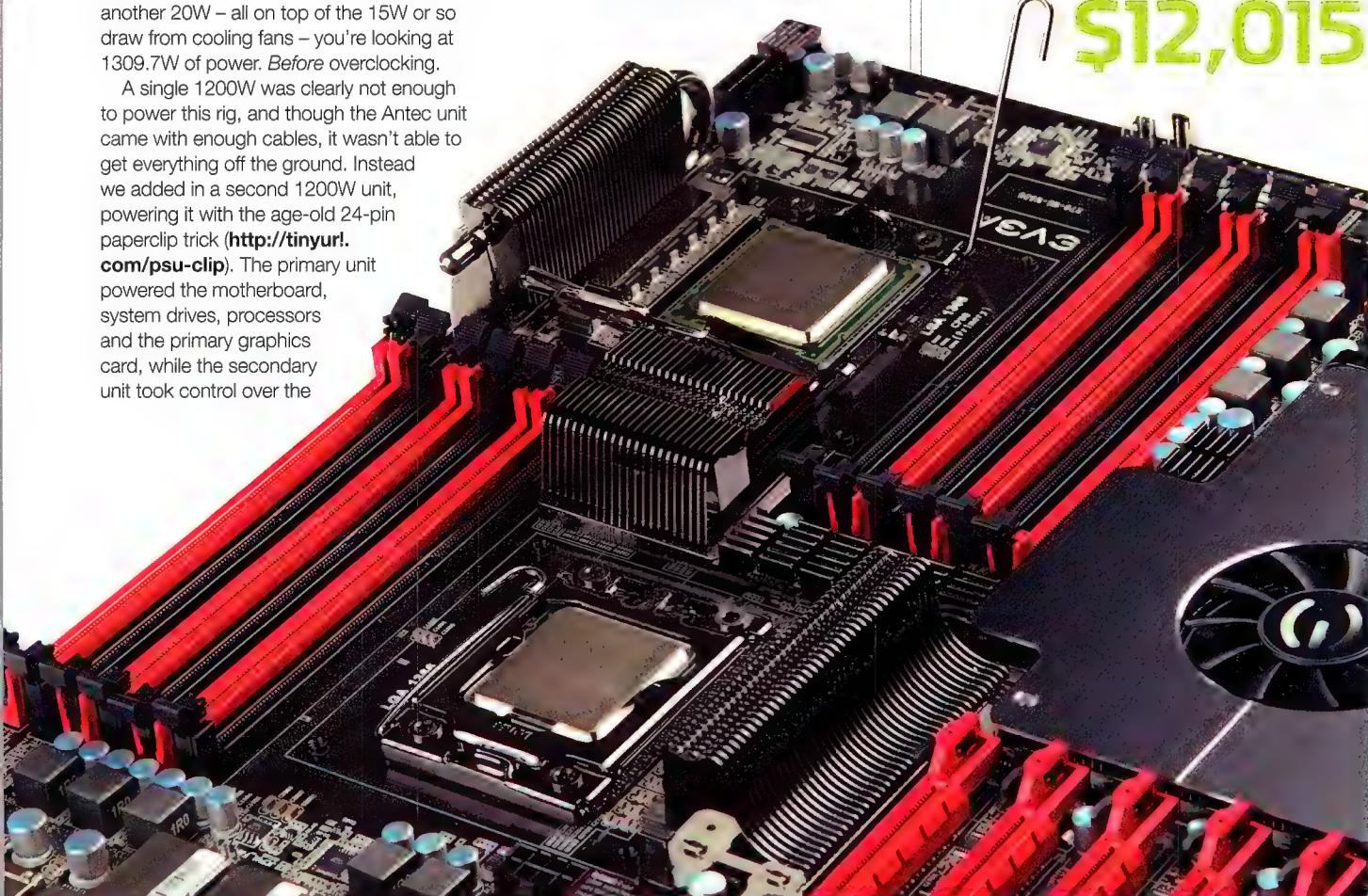
2x Noctua NH-U12DX-1366, **\$200**

4x Antec Tricool LED 120mm, **\$80**

6x Noctua NF-S12B 120mm, **\$180**

Total Cost:

\$12,015



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Stock Performance Analysis

The Beast is undeniably impressive in picture and list form, but the real impact of such a system can only be measured in raw, bloody numbers. We threw everything together carefully, working to point the airflow in a relatively logical way to manage the heat output of the Beast for stability – taking in cool air from the bottom-right corner of the board and exhausting it at the left and top edges, by the graphics cards and processor heatsinks respectively.

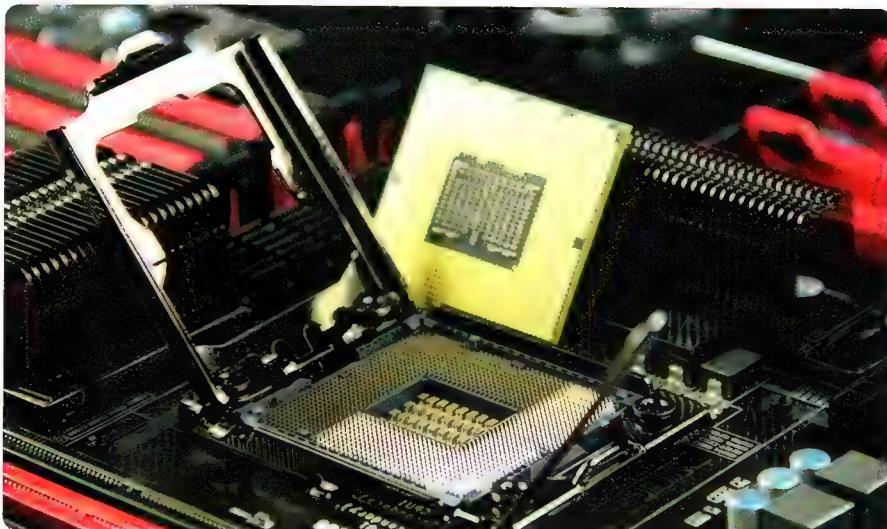
Performance of both hexa-core chips even at stock settings was definitely the fastest we've seen yet: though only when both worked in tandem to tackle workloads. This is most notable in single-threaded benchmarks such as *wPrime* 32M, when a single 2.93GHz core completed in 45.003 seconds – a full 6.284 seconds slower than the higher-clocked Intel 980X at 3.33GHz. *PiFast* is similarly slower, at 5.93 seconds behind the 980X.

Multi-threaded benchmarks are where the Xeon X5670 processors really strut their stuff, and *Cinebench R10* highlights a huge 4659-point advantage over the single 980X. Interestingly we noticed that *wPrime* did not show a performance advantage when testing with 24 threads, being slower than a single 980X, though this seemed to be a problem with the resource allocation of the program itself.

Though the Beast has 20GB of DDR3 at 1333MHz with low 7-7-7-24 timings, bandwidth was merely average and latencies verging on slow, taking 65.9ns to get a response. This is likely due to memory bandwidth problems through the system interconnect, or QPI, as the speed does increase markedly when overclocked.

Hyperthreading is awesome... sometimes

Hyperthreading essentially demands two core's worth of workloads for a single logical core, an unintuitive concept that generally increases



real-world performance by reducing idle time – the less time the core spends waiting for work, the more (theoretically) it can achieve. It has no effect in single-threaded workloads, but can be quite noticeable when dealing in multiples: once

disabled, performance in *wPrime* 1024 drops by 34 per cent to 129.811 seconds; and *Cinebench R11* reduces by 22 per cent to 11.76 points.

The Beast became slightly irritable in some circumstances, though, performing nine per cent faster in *Cinebench R10* for an inflated score of 33090. It seems in this instance that juggling 24 threads at once wasn't very beneficial over a short period of time, though having more threads definitely makes a big improvement with intensive workloads – any rendering work will be completed effortlessly, as will CAD or anything else that can be worked on concurrently.

Is it practical?

Running two six-core processors might seem a little insane, but there are some performance improvements to be had for those interested in specific applications – mere mortals will merely be wasting the potential of the Beast. It's not a cheap path for more speed, but at this ultra-high-end level, it's certainly harder to get faster. That is, until we overclocked every component to the precipice of melt-down.

Standard performance comparison table

	2.93GHz, 133x22; DDR3-1333MHz 7-7-7-24 IT	OC1: 3.52GHz, 160x22; DDR3-1600MHz 7-7-7-29 IT	OC2: 4.29GHz, 195x22; DDR3-1560MHz 7-7-7-20 IT
PiFast	31.39	24.98	20.36
wPrime 32M - single thread	45.003	37.669	31.046
wPrime 32M - multi-thread	6.612 (6.81x)	8.09 (4.66x)	8.203 (3.79x)
wPrime 1024M - multi-thread	96.643	84.934	74.343
Cinebench R10 64-bit single-thread	3888	5006	6120
Cinebench R10 64-bit multi-thread	30005 (7.72x)	37124 (7.42x)	42812 (7.00x)
Cinebench R11 64-bit CPU	14.35	17.14	20.21
Cinebench R11 64-bit OpenGL	27.61	40.38	49.92
Everest Read	12214	13575	16176
Everest Write	9185	9976	12021
Everest Latency	65.9	61.4	50.9

Being a Beast

So what exactly makes up a system like the Beast?

It's not too dissimilar to normal systems, actually, though the main differences are certainly quite important – and it all starts with the EVGA SR-2 motherboard, otherwise known as 'that big rectangle upon which all tech sits'. This important component is quite literally the backbone of the Beast, and though it is physically massive, it does not weigh much by itself compared to the dual-ounce copper designs of competing boards such as the X58A-UD9. It also allows other components to 'talk' to each other, but when dealing with a system such as this, we ran into a few logical problems.

First among these was the sheer weight: with almost eight kilograms of graphics cards at the bottom end and two kilograms of heatsink at the top, the motherboard was incredibly prone to flexing when moved. Shifting the system with cards installed was avoided, and we resorted to lifting the board by the heatsinks to move it around the Labs.

The second problem we ran into was heat generation that affected processor overclocking, as you can see in the table below. Stock load temperatures weren't too bad for either of the two processors, labelled CPU, and each was well within the realm of stability. However, once we began overclocking and fired up our torture test (as explained in the "Takes a licking" box on page 30), the sheer amount of heat from the graphics cards affected CPU1 markedly more than CPU2 – riding the cores hard in the mid eighties. As each processor was overclocked in tandem this provided an artificial restriction on final speeds, but additional cooling on air was impossible.

The third amongst our swathe of problems was that of spacing between components. With barely 5mm between each card and fresh, cool air in short supply, we noticed a very clear trend with temperatures: the top three cards were starved of air. This is somewhat noticeable at idle, as cards G1-3 remained five to eight degrees hotter than G4 (with unrestricted access to air), but the effect became more pronounced under high loads. Though all cards reached ninety degrees, the fans on the first three were forced to work harder to generate enough airflow – manually set to 100 per cent, and temperatures are still in favour of the fourth card. And finally, with all this heat comes noise, measured at strategic points around the Beast – quite definitely a mighty roar.

Decibel Noise Level Readings

Location	S1	S2	S3	S4	S5	S6
Idle	65.2	57.9	60.3	58.3	59.5	62.7
Load	75.8	75.6	74.3	67.3	66.9	73.5
Max Load	81.3	80.5	84.6	73.5	72.1	79.1

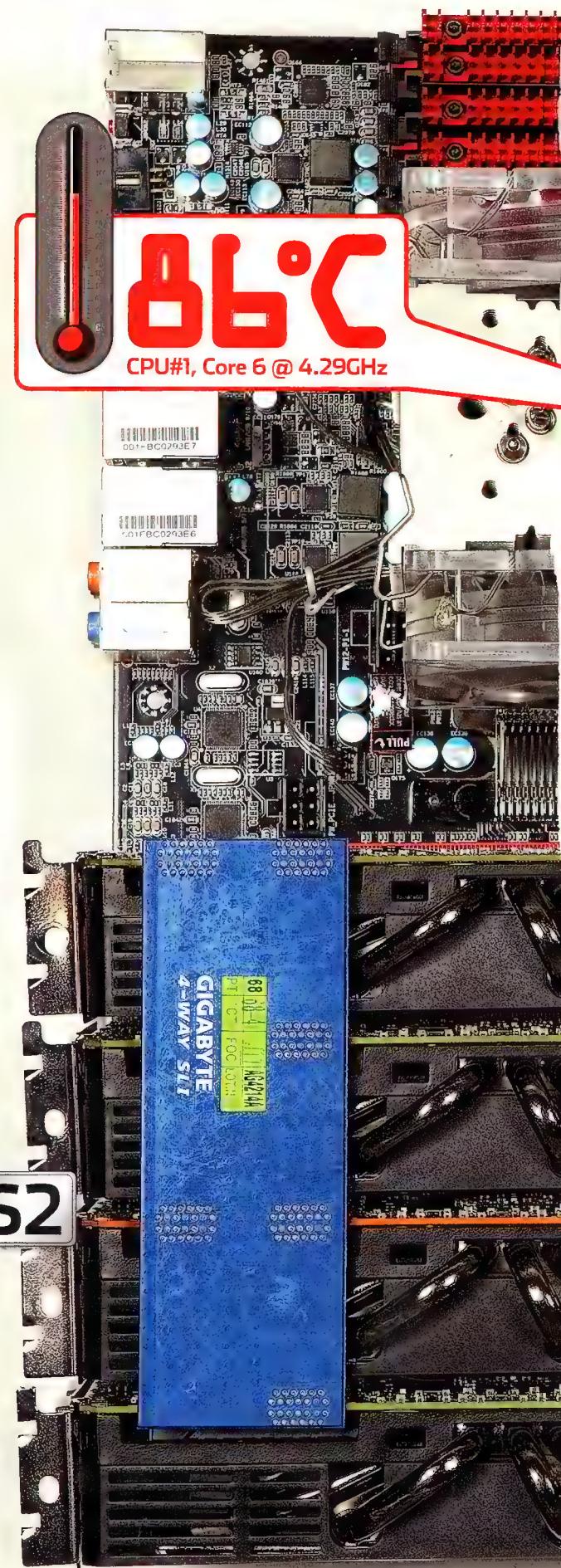
Graphic Card Temperature Readings

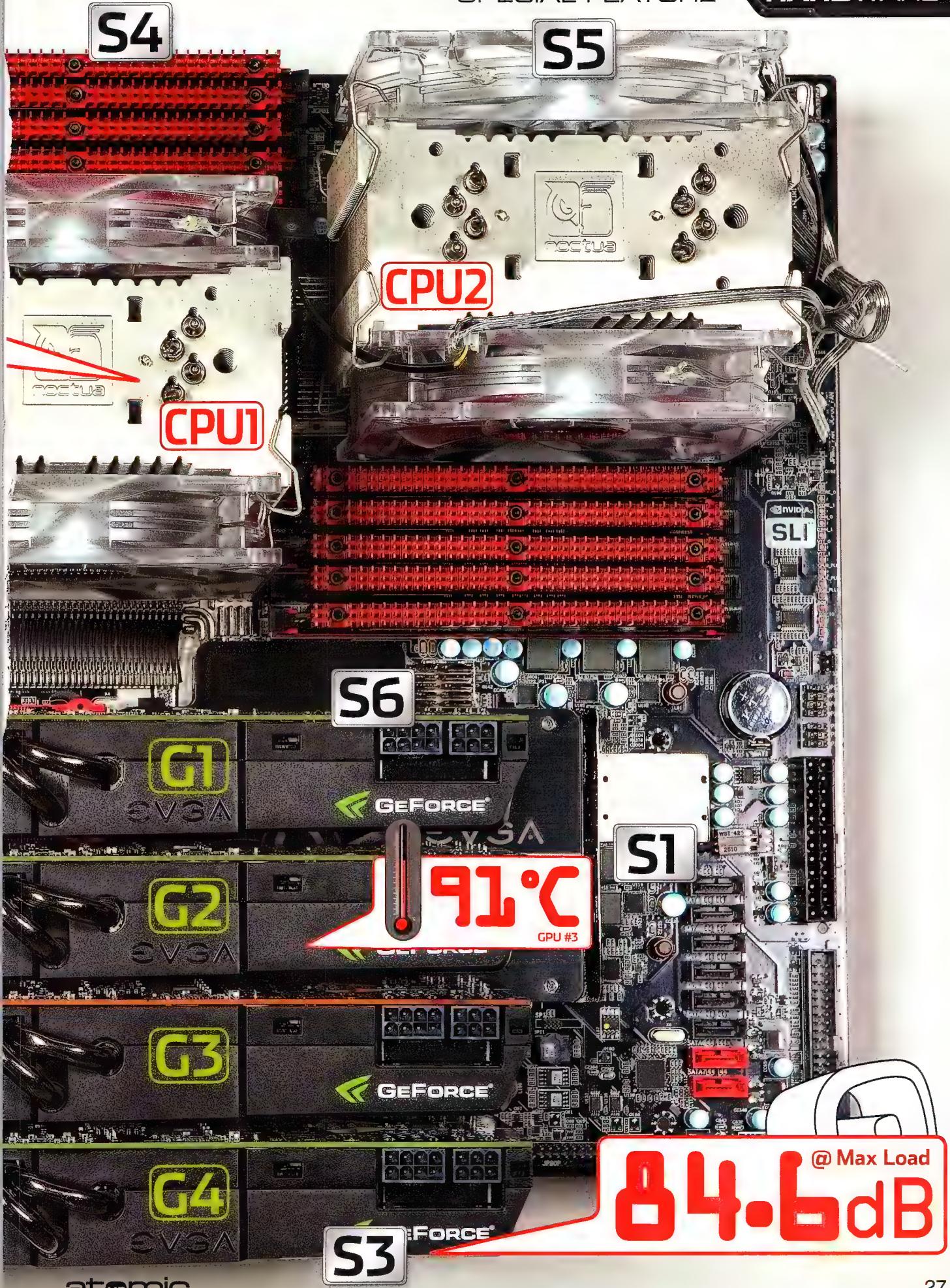
Card	G1	G2	G3	G4
Idle Fan 44%	56	54	57	49
Load	90 @ 80%	90 @ 82%	91 @ 79%	90 @ 71%
Fan 100%	77	79	78	71

Processor Temperature Readings

CPU #1	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Stock Load	54	43	48	53	51	43
OC2 Load	85	85	80	79	84	86
CPU #2	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Stock Load	45	39	40	42	46	42
OC2 Load	78	72	72	68	75	72

OC2: 4.29GHz, 195x22; DDR3-1560MHz 7-7-7-20 1T





WHY STAND TOGETHER?

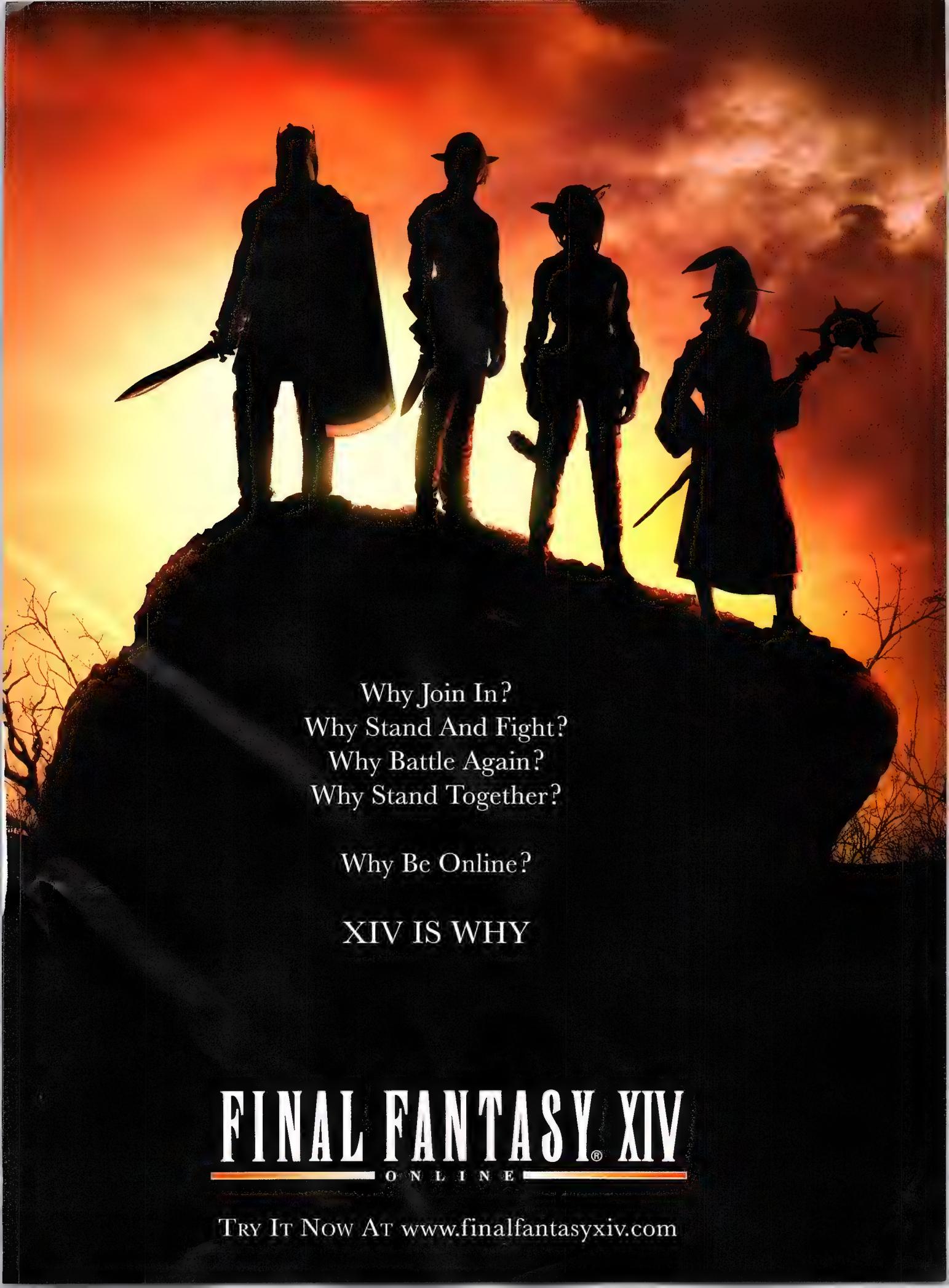


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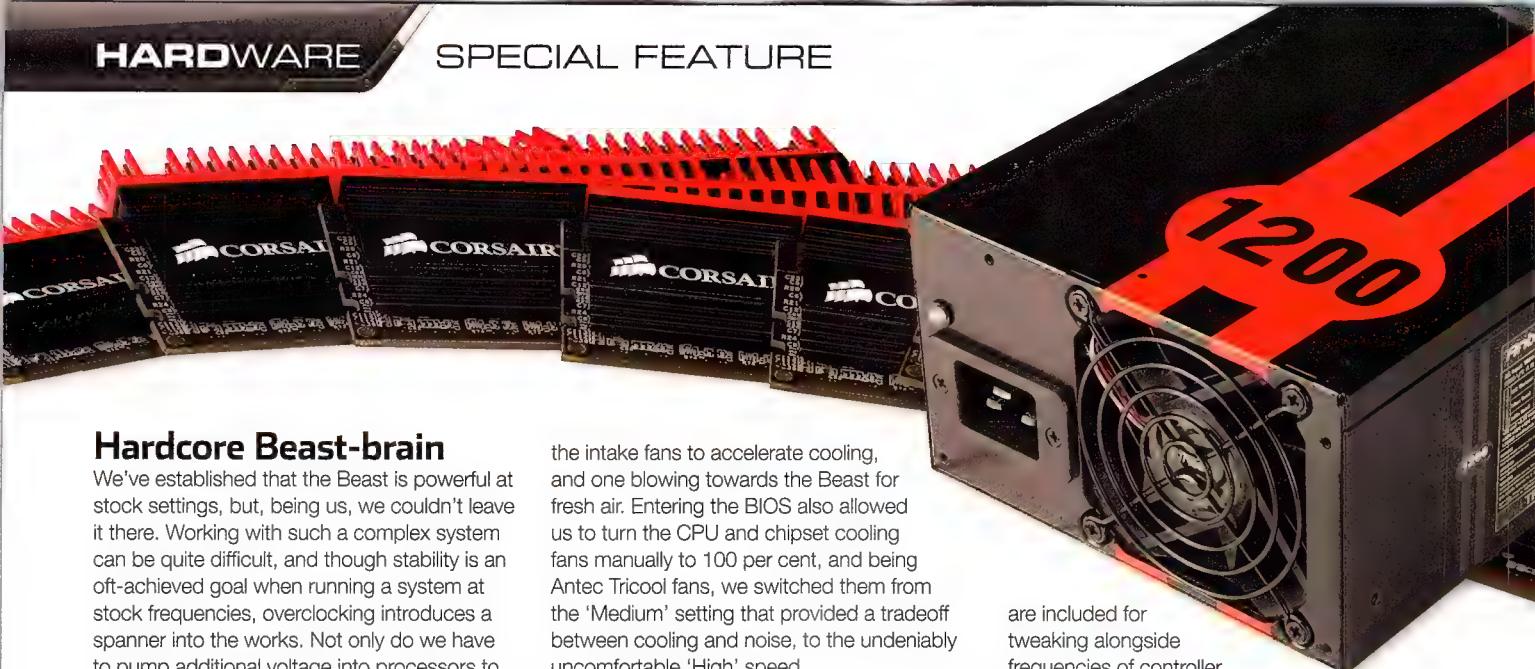
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Hardcore Beast-brain

We've established that the Beast is powerful at stock settings, but, being us, we couldn't leave it there. Working with such a complex system can be quite difficult, and though stability is an oft-achieved goal when running a system at stock frequencies, overclocking introduces a spanner into the works. Not only do we have to pump additional voltage into processors to improve stability, but increasing frequency of all silicon components in the Beast also causes temperatures to skyrocket, as seen on page 26.

To prepare for this we added six Noctua fans to the system: resting four across the top of the graphics cards blowing downwards, one at

the intake fans to accelerate cooling, and one blowing towards the Beast for fresh air. Entering the BIOS also allowed us to turn the CPU and chipset cooling fans manually to 100 per cent, and being Antec Tricool fans, we switched them from the 'Medium' setting that provided a tradeoff between cooling and noise, to the undeniably uncomfortable 'High' speed.

Navigating around the BIOS was not a difficult task, with most options clearly visible, though all lacking much explanation. This is definitely not a board for those new to overclocking, but for what is essentially a server motherboard, it's very functional. All voltages

are included for tweaking alongside frequencies of controller chips, though the entire system felt extremely sluggish with all graphics cards connected – the Power-On Self-Test (POST) in particular took up to half a minute or longer to complete.

We got our bearings and had both our processors running at the first overclock step, OC1, which equates to a speed of 3.52GHz for both X5670 chips – and all twelve cores. This was achieved with a simple QPI frequency raise, and no additional voltage was required to get this speed stable underneath the largest torture test we threw at the system.

From here we continued to push the QPI, slowly raising past 4GHz and moving onwards to our final, ultimately stable destination. Though we did briefly break 4.4GHz on both processors (as seen in the validation <http://tinyurl.com/Beast-4-4>), this consistently crashed in testing due to excessive heat. Luckily we had been blessed by the Gods of Tech and granted with two great chips that both sat happily at 4.29GHz, henceforth referred to as OC2, which is no mean feat considering each had a locked multiplier of 22x. Unlike Intel's standard desktop range there are no unlocked Xeons, and as the processors were immovable, the motherboard QPI frequency had to be increased to 195MHz from a stock of 133MHz.

OC2 OMG

When you're playing around with what is essentially a one-and-a-half times frequency boost (46 per cent increase over stock), the performance of the Beast is irresistible. As can be seen on page 25, we see both single- and multi-threaded workloads receiving a massive performance boost.

The efficiency scaling of the processors was impressive: *Cinebench R10* multi-threaded increased by 43 per cent; *R11* increased by 41 per cent; *wPrime 1024* by 30 per cent; and *PiFast* by a huge 54 per cent!

At these speeds it's easy to see the appeal of the SR-2 as a platform, and rather than buy a workstation with absolute top-end tech (which is very expensive), it enables the user to buy lower-end tech and overclock it themselves to get the necessary grunt – we definitely approve.

Takes a licking...

For long-term extended use of any overclocked component, we at Atomic always tout the importance of stress testing: and we've devised a truly devilish torture test to wreak havoc on even the most confident of players. Though the load this will place on your hardware will be excessive to the extreme (and seriously, don't blame us if you get temperature problems), if it can pass this combined load for one hour without exploding then your hardware will be rock-solid under every other use. Here are some free programs to get you started:

MSI Kombustor (6.71MB):

<http://tinyurl.com/MSI-Komb>

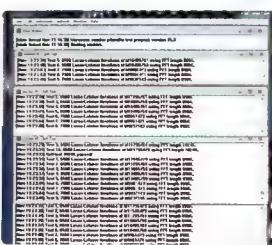
A program developed from Furmark, and bundled with MSI's overclocking software Afterburner (itself based on Rivatuner). Stresses graphics cards significantly, and will tax any power supply heavily. We ran in OpenGL3 at 2560x1600, 16xAF, which utilised the primary card 99 per cent and the additional cards 70 per cent. Visual errors appear as black marks or stuttery frames. Makes a Starcraft 2 menu look easy.



Prime95 x64 (1.05MB):

<http://www.mersenne.org/freesoft/>

Originally designed to find new prime numbers, *Prime95* takes on a new lease of life as an incredible stressor of floating-point units within modern processors. While FPU generally don't get a real workout under normal use, the included 'Blend' test will load up 24 threads and the memory modules with a heavy workload. Has built-in error detection for all threads.



OCCT 3.1.0 (4.47MB):

<http://tinyurl.com/OCCT-DL>

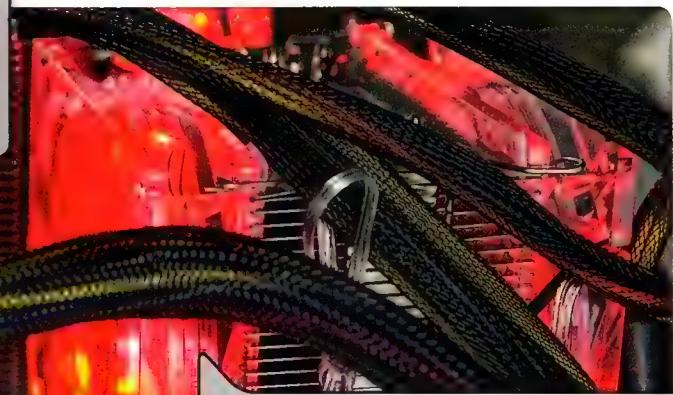
OCCT, or OverClock Checking Tool, is an invaluable part of any toolbox. Not only does it stress the processors of any system and detect errors, but it also graphs temperatures and voltages over the course of its standard one-hour run. However, we ran it with 'small data sets' for an infinite time to really give the CPU something to complain about.



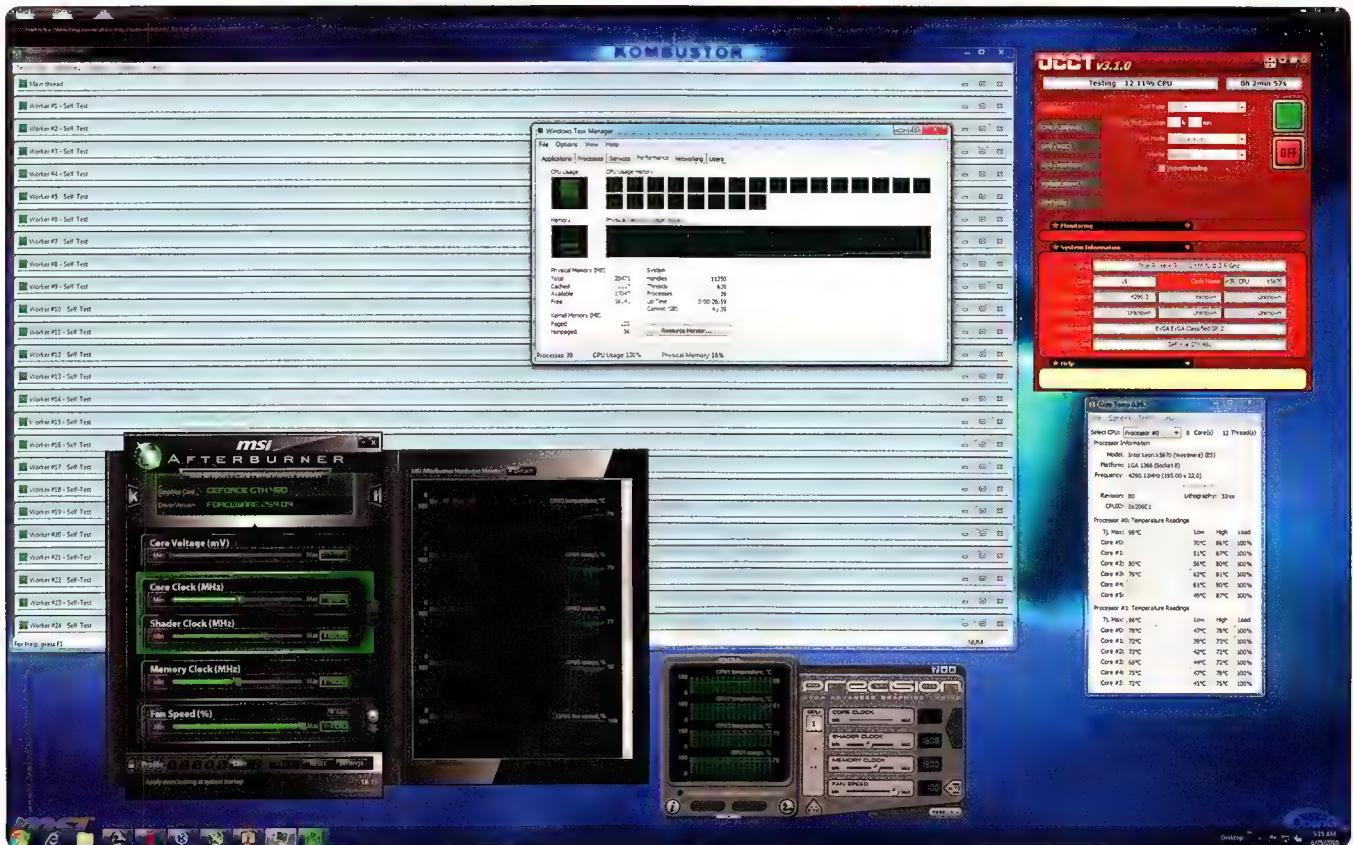
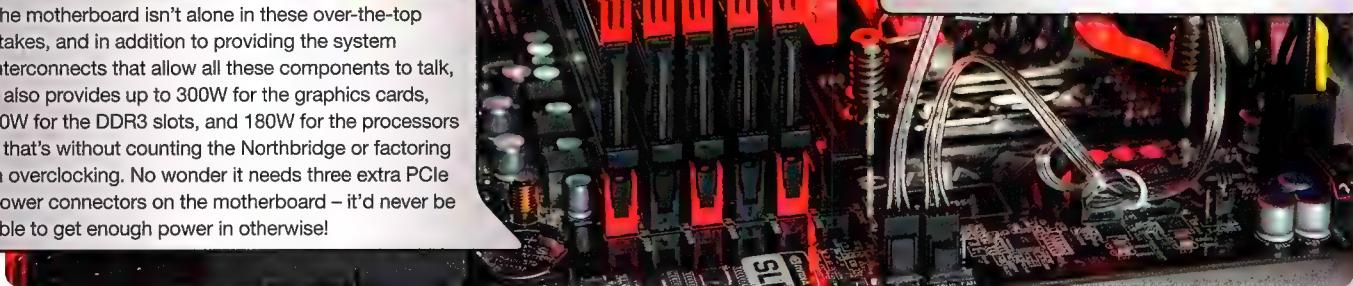
Four overclocked GTX480s signify a combined memory bandwidth of **740.4GB/s**, are able to pump out **156.8 gigapixels per second**, and demand **32GB/s** worth of data from the 5520 Northbridge. Four GF100 'Fermi' cores take up an area of **2104mm²**, and generate **47.53W** of heat per square centimetre at full load. Seriously powerful!



The motherboard isn't alone in these over-the-top stakes, and in addition to providing the system interconnects that allow all these components to talk, it also provides up to 300W for the graphics cards, 60W for the DDR3 slots, and 180W for the processors – that's without counting the Northbridge or factoring in overclocking. No wonder it needs three extra PCIe power connectors on the motherboard – it'd never be able to get enough power in otherwise!



Dual Intel X5670s aren't as power-hungry as the cards, but still chew through **20.14W** of power per square centimetre of chip while only demanding 15W for each processing core. Cooling them are four fans that spin at **2000RPM** each for a massive **316cfm** – or cubic feet per minute. That's almost **9000 litres of air**, which expands in volume as it warms to fill in almost twenty per cent more space!





A mighty roar

Pure processing power is an essential characteristic of any system, but to truly make the Beast worthy of its name, we needed it to pack some truly drool-worthy hardware. We tested initially with four GTX480 cards running at stock processor speeds, running through our standard benchmark suite. There were some problems with getting SLI working properly, but once we had 4-way activated we noticed a strange quirk – performance of the system with PhysX piped to the graphics cards was markedly reduced in all situations. Redirecting PhysX to all four cards sequentially didn't

remedy the performance problems, which were finally fixed once PhysX was run on the CPU. At least we had some cycles to spare!

Performance at stock levels wasn't all that impressive: returning a *3DMark Vantage* score of P34959; *Crysis* average of 24.27 – though *Heaven* displayed a phenomenal 78.6 average frames. This is a fantastic show of 4-way's potential performance, and is even more impressive considering we run the *Heaven* benchmark at 1920x1200 with 8xAA, 8xAF and 'Extreme' tessellation.

Strangely, the performance numbers took an odd turn when we overclocked the dual processors through OC1 and OC2: *3DMark* scores trended downwards for graphical scores but **upwards** for processing scores; *Crysis* dipped briefly at OC1 but recovered slightly for OC2; and *Heaven* barely changed. Confused yet? We sure were! Even more confusing was the *3DMark* score when we had overclocked each GTX480's core to 817MHz and the memory to 3854MHz (validated here <http://tinyurl.com/Beast-OC>) - inflating the score to P39916, and gaining an additional 8000 graphical points on the back of this 17 per cent graphical overclock.

We spoke to legendary overclocker Shamino at EVGA who explained that, under extreme loads, the QPI bus was known to get a little sketchy. "I think your QPI is 'throttling' at the 4-way

test in Vantage, maybe in test 2 where it is extremely QPI intensive." This basically means there is so much data flowing through the board that it's clogging up, and slowing down the data flow so it doesn't catastrophically bust a pipe and spray chunks of gooey texture data all over the room.

Third time lucky

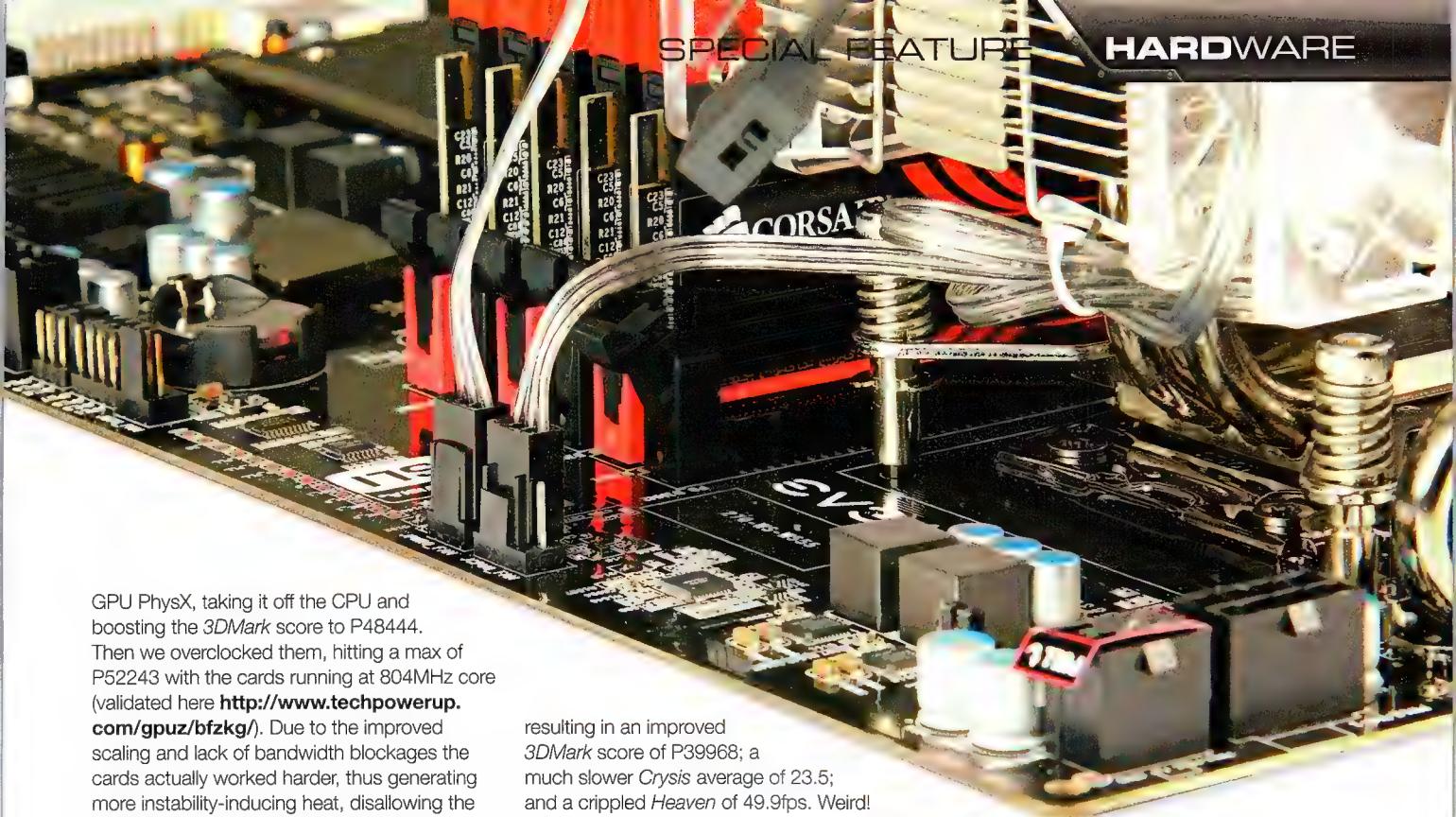
To test this theory we removed the fourth GTX480 card from the Beast, and ran it again at OC2 for comparison's sake. Performance increases were ridiculous: *3DMark* rose by 10494 points to P43245; *Crysis* blew us away with an average framerate of 94.4 (3.9x faster!!); and only *Heaven* showed the loss of a card as it moved backwards by 7.5 frames to 70.2fps.

Moving to three cards also let us enable



Graphics Performance Comparison

	3DMark Vantage	Crysis Avg	Crysis Min	Crysis Max	Heaven Tess	Heaven None
4-Way: STOCK	P34959 (C: 32108, G: 36025)	24.27	15.18	31.87	78.6	104.1
4-Way: OC1	P35205 (C: 38621, G: 34197)	22.87	8.63	28.98	79.5	106.5
4-Way: OC2	P32751 (C: 43777, G: 30214)	35.02	20.32	49.51	77.7	107.4
4-Way: OC2/QPI	P39968 (C: 47180, G: 38030)	23.5	10.79	30.72	49.9	60.4
3-Way: OC2	P43245 (C: 46224, G: 42335)	94.4	42.77	116.09	70.2	108



GPU PhysX, taking it off the CPU and boosting the 3DMark score to P48444. Then we overclocked them, hitting a max of P52243 with the cards running at 804MHz core (validated here <http://www.techpowerup.com/gpuz/bfzkg/>). Due to the improved scaling and lack of bandwidth blockages the cards actually worked harder, thus generating more instability-inducing heat, disallowing the higher clockspeeds. Finally, just for giggles, we ran 3DMark 06 at stock settings and got a score of 29854. This benchmark is not so relevant for its age and lack of scaling with this much hardware, but the Beast definitely rips through it effortlessly.

Shamino had another suggestion involving the Intel 5520 chipset (known in the BIOS as IOH, or Input-Output Hub), increasing its voltage from a stock of 1.1V to 1.4V, then boosting the IOH QPI signal to a value of -60. After banging it into the BIOS we tested with four stock-clocked cards at OC2 once more:

resulting in an improved 3DMark score of P39968; a much slower Crysis average of 23.5; and a crippled Heaven of 49.9fps. Weird!

Taming the Beast

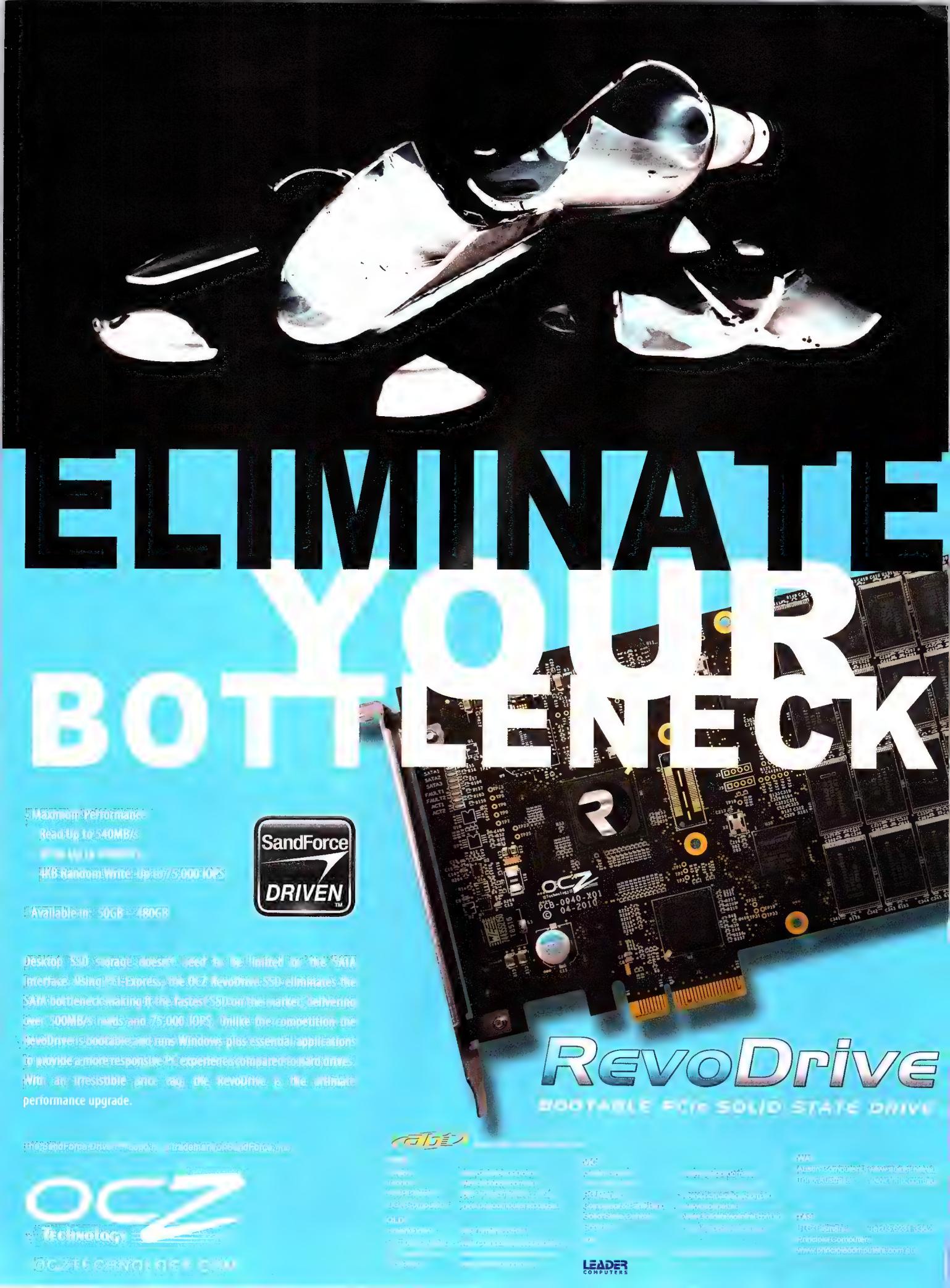
At the outset of the Beast we knew we'd be in for a serious experience, but we never anticipated the twists and turns that this road would lead us down. We had innumerable crashes from dodgy drivers, searing heat and instability, not to mention problems arising from the immense size of the Beast, providing enough power for its many processors, and in the amount of time we spent with it, we could have easily built, benched and overclocked four high-end rigs. But was it all worth it?

God, yes.

If you need the ultimate in processing performance, and if you need it **right now**, then building a system like this is definitely a good investment – and you might even save yourself some cash on an equivalent workstation to boot. It's a bit much (okay... a lot much) for the average gamer, but for the technology enthusiast who *has* to have the best of everything, you really can't best the Beast.

Just watch it doesn't develop a mind of its own... 





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HARDWARE

NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

So, you've read all about our new baby and you've got a hankering for some new hardware? We don't blame you. Luckily Justin is back in the building this month, so we've locked him in the labs and told him not to come out until he's reviewed everything in there. And we mean everything; apparently his chair is a little too squishy and offers poor lumbar support, but is a

nice blue colour and can spin really fast.

On a more serious note, the ASUS Ares lands this month, and we find out whether you really need a graphics card that weighs more than your head and costs more than your television. There's also a round-up of NASsive proportions (sorry), and a whole swag of other reviews and hardware fun. Enjoy!

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42





POS B
The Ultimate Gaming Case



Top view
2 x 14cm fan Orange
LED fans (Included)



Added PCB provide
extra fan connec-
tion and reduce
cable mess



Can install 1x14
fan with fan filtera



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reduce mess
inside the chassis



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HDD rack



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of screws are
easy to find



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5.25" bay



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panel to extract heat
from chassis



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or 80mm(15mm
thickness) to cool
CPU



Tool-Free for
PCI slots



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for water cooling



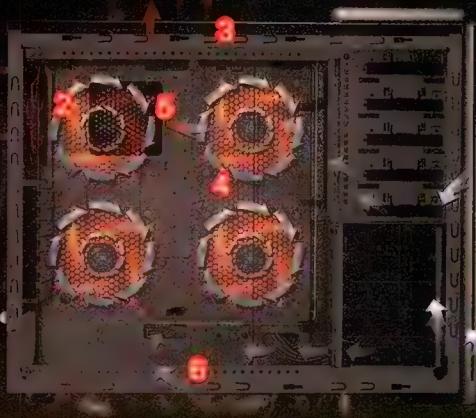
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and reduce cable
mess



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Intel Core i5 655K

This is what your brain looks like, without padlocks.

Street Price \$270 Supplier Intel

Website www.intel.com

Specifications 3.2GHz dual core (3.46GHz Turbo); 32nm manufacturing process; 'Clarkdale' core; 64KB L1, 256KB L2, 4048KB L3; 24x unlocked multiplier; 73W TDP; LGA1156; integrated GMA HD 733MHz

We've had Intel's range of Core i5 and i3 processors for some time now. They were notable at launch for integrating a graphics adapter within the processor's package, seen as the larger of the two rectangles (dies) pictured below. They also failed to really impress us for much the same reason.

Now, integrating a graphics card into a processor is something to be truly excited about – like what AMD's working on with their Fusion tech – but what we see in the i5 655K is nothing even close to a real card. Instead, it is a slightly improved version of the GMA chips we've seen in netbooks, and though we were told by Intel spokespeople that they were "great for gaming", in reality they're just enough for high-definition video and *Farmville*. The 655K also boasts a lower-clocked version of the GMA HD, running at 733MHz rather than 900MHz, though it can be marginally changed via the BIOS.

Thankfully the processing cores aren't quite the pushovers that the graphical side is, and though there are only two, they are descended from the 980X architectural design and boast all

the relevant improvements:

32nm, increased SSE instructions, and a lower power usage per core. Though they still have 64KB and 256KB of L1 and L2 cache dedicated to each processing core, there is a large shared pool of L3 cache to the tune of 4MB that should offer some breathing space when running intense workloads.

The 655K also integrates sixteen PCIe 2.0 lanes within the processor itself alongside a memory controller, eliminating the need for a dedicated northbridge and allowing direct access to expansion cards and system memory. There is enough bandwidth on offer for dual-card graphics, if one is willing to sacrifice potential performance, but it is really a mainstream platform, so single-card is perhaps more appropriate. Annoyingly the inbuilt memory controller resides with the GMA die on the processor package, and though it offers high bandwidth and lower latencies to the graphical processor, the logical processors are inflicted with much higher penalties, as data must flow between dies – creating the same problems that were seen with the LGA775 platform.

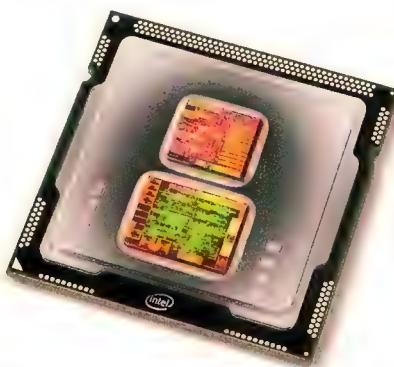
Actual performance isn't too bad, performing well in most benchmarks due to the large amount of cache, though *Everest* suffers markedly from the aforementioned design flaw. Overclocking to OC1's frequency of 3.6GHz, boosted from a stock of 3.2GHz, was easier than breathing inwards, and did not even require a voltage increase from a stock of 1.2V for stability. OC2 was similarly easy, as the QPI bus and voltage were raised to 175x24 and 1.35V respectively, for a real-world speed of 4.2GHz. This speed was very noticeable within Windows, and there was a tangible difference in system responsiveness compared to stock speeds.



We continued overclocking the traditional way, increasing the

QPI bus to a final stable speed of 185x24 at 1.375V for a stable 4.44GHz that scored 14,844 points in *Cinebench R10* – representing a 39 per cent clockspeed increase, and a 36 per cent rise in performance to boot. This overclocking performance is identical to that of the Core i3 540, online at www.atomicmpc.com.au/?214312, which is a strange coincidence.

The 655K is slightly different to the \$50-cheaper i5 650, and the extra cash grants an unlocked multiplier at the cost of a stock heatsink, which is not included. Annoyingly the 655K topped out at a speed of 4.42GHz under 134x33 settings, and scored only 14033 in *Cinebench*. It's nice for those who want a mild overclock without affecting other components such as the motherboard or memory; but it doesn't offer any real value to overclockers. Instead, we'd point you towards a vanilla 650 – or even better, an i7 860. 



Intel Core i5 655K

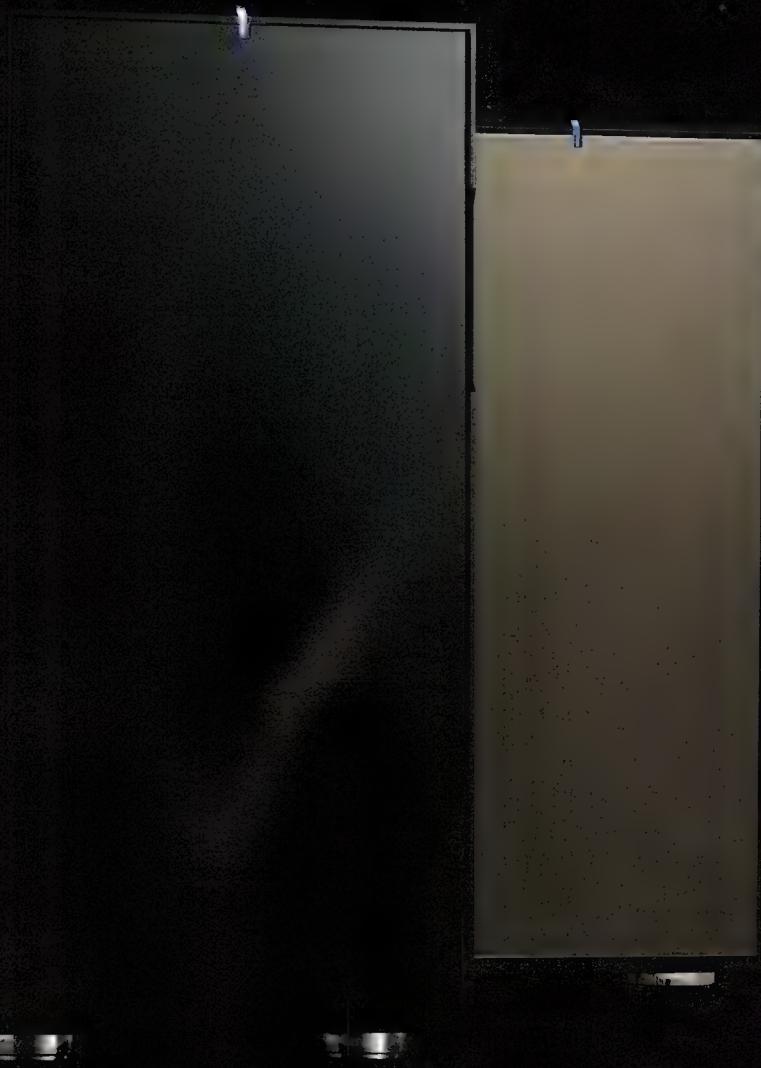
	Stock: 133x24; DDR3-13337-7-7-21	OC1: 150x24; DDR3-15007-7-7-21	OC2: 175x24; DDR3-16007-7-7-21
PiFast	26.30s	23.53s	20.48s
wPrime 32M – single thread	38.424s	34.554s	29.717s
wPrime 32M – multi-thread	14.666s (2.62x efficiency)	13.414s (2.58x)	11.452s (2.60x)
CineBench R10 64-bit – single thread	4852	5336	6223
CineBench R10 64-bit – multi-thread	10940 (2.25x efficiency)	11967 (2.24x)	13871 (2.23x)
Everest Read	9970MB/s	10970MB/s	11778MB/s
Everest Write	7696MB/s	8521MB/s	9706MB/s
Everest Latency	74.6ns	68.6ns	65.3ns





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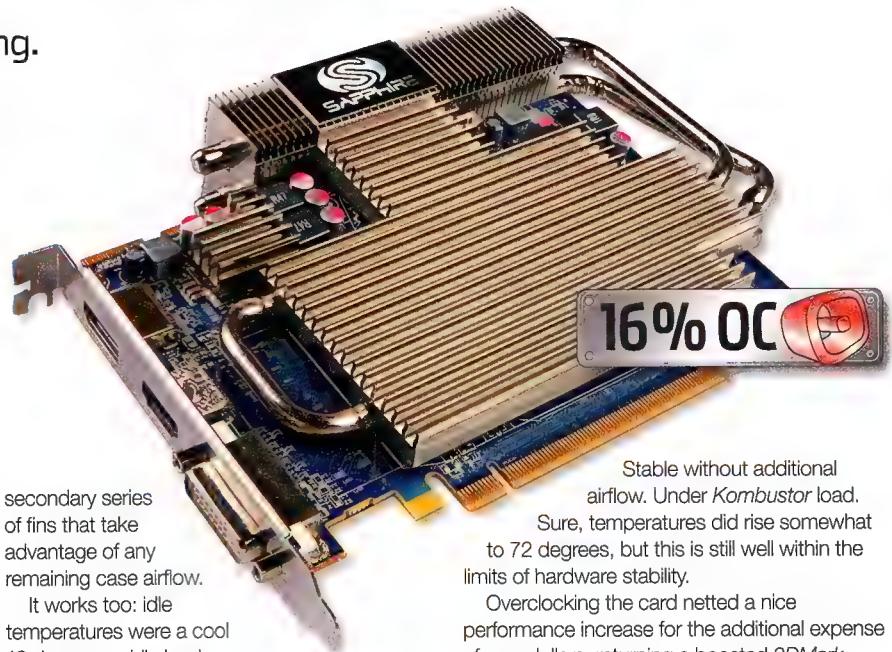
Specifications 775MHz core; 1000MHz memory (4000 effective); RV870 'Redwood XT' core; 400 shader units; 1024MB GDDR5; 128-bit memory interface; single slot PCB with passive cooling

Card info <http://www.techpowerup.com/gpuz/avpep>

There comes a time when high performance computing just isn't what you're after. Though we are at first challenged by this unnerving – and quite frankly, scary – impulse, there are a few ways we can reduce noise without handing in our self-respect. After all, Maximum Power is not always synonymous with silence! One of the largest culprits of noise in any given system is most likely the graphics card – until recently, it was not uncommon for these slabs of silicon to boast fans the size of Batman's rubber nipple; forced to spin horrendously fast to move any air at all.

We've moved past these embarrassingly loud solutions for the higher-end cards (for the most part), but it's when we look at the mid-range cards that we start to see the tiny fans creeping back in. Sapphire have just done away with a fan entirely, but rather than causing a catastrophic meltdown, it seems in this case to offer an improvement over an actively-cooled design!

The reason for the Ultimate's heatsink success can be attributed to just that: the heatsink is designed superbly well. It is simple, consisting of a shaped aluminium plate with lateral fins that catch any available case airflow and channel it along the length of its heat-radiating surface. Two heatpipes have also been added that both begin within the primary plate, curving beneath its ridged surface to distribute the heat across it more effectively, then curling upwards to a



secondary series of fins that take advantage of any remaining case airflow.

It works too: idle temperatures were a cool 42 degrees, while load temperatures in *Crysis* hit 58 degrees – in the worst-case scenario of being placed out in the open without any real airflow. The Ultimate did warm up a little more when placed under extreme stress using *Kombustor*, though it topped out at 66 degrees. We imagine this card would be more than manageable in a case with even the barest of air movement.

It's even a decent overclocker, hitting the ill-enforced software clockspeed limit of 850MHz core and 1050MHz memory without breaking stride, using both *EVGA Precision* and *MSI Afterburner*. Not ones to let something so trivial hold us back, we flung open *AMD GPU Clock Tool* and pushed the core clocks to their ultimate resting place at 900MHz, resulting in a sixteen per cent improvement over factory clocks.

Stable without additional airflow. Under *Kombustor* load.

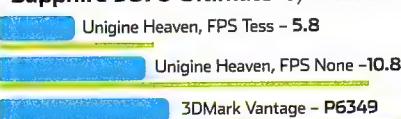
Sure, temperatures did rise somewhat to 72 degrees, but this is still well within the limits of hardware stability.

Overclocking the card netted a nice performance increase for the additional expense of zero dollars, returning a boosted *3DMark Vantage* score of P7207. This represents an additional 14 per cent of measurable performance, and is nothing to sneeze at for a card sans fans. Interestingly this is on par with the reference-design 5670 card, online at www.atomicmpc.com.au/?170623.

However, there are some caveats. The bundle for the card is bare save an instant messenger plug-in that claims to improve the quality of webcam streams. Not exactly exciting stuff. It also commands a higher price than the reference design – while there is no official price set, passive requires more metal, which is expensive.

All things considered, the Ultimate is a nice little card for a media rig, is screaming out for a very easy overclock, but won't quite satisfy those power-hungry users out there.  JR

Sapphire 5670 Ultimate Synthetic Benchmarks



Score

Sapphire 5670 Ultimate Gaming Benchmarks



Frames per second

atomic

= Reference scores: XFX 5850



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MSI N460GTX Cyclone



Blown away by another GTX460.

Street Price \$300 Supplier MSI

Website <http://au.msi.com>

Specifications 726MHz core; 900MHz memory (3800MHz effective); 1451MHz shader; GF104 'Fermi' core; 336 CUDA Cores; 1024MB GDDR5; 256-bit memory interface; dual slot PCB with active cooling; dual 6-pin power connector

Card info www.techpowerup.com/gpu/zashg

NVIDIA has finally got it right with Fermi. The company's struggled a lot along the way, but the new Fermi core is a new monster entirely. Specifically, this card runs a version of Fermi labelled GF104 which indicates a reduced die size of 367mm² (down from 529mm²), a similar drop in transistor count to 1.95 billion (from three billion) and a fall in processing cores to 336 (from

Dance party!

Overclocking the Cyclone went well... too well. We flung open Kombustor and overclocked the core to 870MHz, representing a 20 per cent clockspeed increase. It was stable at first, but when we tried to run *Vantage*, things went a little sparkly. We watched in a trance for a time, then dropped the clocks to a more reasonable 836MHz – completing *Vantage* with a score of P18690. Somehow, we're not sure it was a total improvement...



a possible 480).

In some ways the GF104 is half of a GF100, and though it quite literally has half of the Streaming Multiprocessor count (physical allotments of processors, marshalled into groups), the SMs in the GF104 contain more processors than the original GF100 – packing 48 per SM compared to 32. Though one of the SMs is non-functional, for a total of seven, this gives 336 processors in total: not the 224 that would come with a simple halving of a core.

The processors all run at a slightly boosted factory speed of 726MHz (+51MHz), with a 256-bit memory bus enabling access to 1024MB of GDDR5 chips that run at reference clocks. It's also capable of doing all the PhysX acceleration and GPGPU work you can throw at it.

Visually the Cyclone is an interesting take on what would otherwise be a boring reference design, planting a large aluminium and copper plate against the GF104 core, impregnated by two heatpipes that distribute the thermal energy

to two external 'wings'. In the centre of this array of metal lies the fan that gives embodiment to the name Cyclone; though it remains quiet at idle with 49.8dBA and only slightly cyclonic at load with 61.8dBA.

Most surprising were the temperatures – idle sat at a chilly 29 degrees, while load in *Crysis* only topped out at 50! This is even more impressive considering the 160W TDP rating for the card, and essentially means that the card will remain cool in practically any situation one could dream up. Except perhaps an oven.

The small factory overclock also gave a noticeable benefit to our benchmarks, returning nice scores in benchmarks that were higher compared to the GIGABYTE GTX460 from last Issue. However, MSI's Cyclone trumps that card in temperatures and performance, generating a little extra noise as a trade-off.

There's nothing bundled with the Cyclone, but it's still a great card for the price. There's even an argument for running two of these in SLI rather than one GTX480 – but that's for another day. In the meantime, you'll be doing yourself a favour to nab one of these puppies. 

MSI N460GTX Cyclone Synthetic Benchmarks

Unigine Heaven, FPS Tess – 17.5

Unigine Heaven, FPS None – 51.1

3DMark Vantage – P16319

Score

MSI N460GTX Cyclone Gaming Benchmarks

Avg – 30.80

Min – 25.18

Max – 35.96

Avg – 58.67

Min – 44.00

Max – 53.00

Frames per second

atomic

= Reference scores: XFX 5850

Performance
Great performance, good overclock.

92

Bundle
Could use something extra.

70

Value
Price/performance, now slightly higher.

92

Build
Loud-ish, though temperatures impress.

95

Overall
A GTX460 that just makes sense.

93%

ASUS ARES

When over-the-top just wasn't enough.

Street Price \$1600 Supplier ASUS

Website www.asus.com

Specifications 850MHz core; 1200MHz memory (4800 effective); dual RV870 'Cypress XT' cores; 3200 shader units; 4096MB GDDR5; 256-bit memory interface; triple slot PCB with active cooling

Card info <http://www.techpowerup.com/gpuz/m3xm5>

ATI was first out of the gates with a DirectX11-capable core. It was also the first to design a card that featured two of those cores on a single PCB; the venerable HD5970, notable for still topping the single-card performance stack. As powerful as the 5970 was (and still is), a bunch of manufacturers decided to take it a step further and increase the clockspeed of those cores even higher. ASUS was within that bunch, and like that overeager banana that ripens three days before the rest, ASUS has pulled out all the stops with its own flavour of the 5970. Which brings us...

Ares: Greek War God

When ASUS engineers sit down at the drawing board and are told to design a ridiculous top-end card, they are quite honestly given free reign. We've seen it before with the Mars, a dual GTX285 monster, and they've done it again with the Ares – essentially a dual HD5870.



Each core runs at factory speed of 850MHz, encapsulating 1600 shader units that combine for a total of 3200. Accompanying these are two 256-bit memory buses, which remain exclusively attached to a single core, and each has access to 2048MB of speedy GDDR5 memory chips, for a physical total of 4GB.

Power requirements for such a card are similar to the Sapphire 5970 Toxic from last issue; but in this case have been expanded to offer dual

8-pin PCIe power connectors and an extra 6-pin connector! Electrically the card connects via a full-length PCIe 2.0 slot, giving each core an 8-laneway pipe to the rest of the system, which should be plenty for its workloads. There's the standard three outputs on-hand – DVI, HDMI and DisplayPort – and there's laughably a single CrossFire connector at the top of the card. We imagine this is there for amusement's sake, as the Ares is going to be a limited run, though the card can technically be run in Crossfire with a 5870 or 5850. Why any rich moneybags would want to is another matter entirely.

See how it shines...

Once the engineers had finished this card, they mentioned it to the marketing department, who went off and did some research on Ares' past and found that his armour was an important part of the Greek mythology – so they threw the blueprints back at the engineers and said

'All that bronze stuff? Yeah, like, do something close to that. And shiny!' Or so we imagine.

However that little conversation happened, the end result is clearly in imitation of Ares' blazing bronze body armour, and it's quite impressive in person. Constructed within an excessively large form factor, the Ares bursts through the height restrictions generally placed on expansion cards; and similarly pushes outwards to fill out

three expansion slots, while remaining lengthy.

Built up in layers from the silicon PCB that plays host to the cores, memory chips and power systems, the first layer consists of a shaped aluminium plate that clamps on to each side of the card. Covering every major component bar cores, this plate has



thermal pads between it and the card to avoid electrical shorts and to aid heat transmission. The second layer involves two large copper heatsinks: quite literally a shaped block of copper, with four 8mm copper heatpipes embedded within. These are separate and cool each core individually. Copper isn't quite bronze, but it so turns out that bronze makes a terrible material for cooling things due to its low thermal conductivity.

Who knew?

The third layer consists of a large plastic shroud that enshrouds the other two layers, and boasts a large 120mm cooling fan. In totality this is an impressive design and is certainly eye-catching, but it's not as quiet as we'd

Being brief

The Ares comes packed in foam, nestled within a briefcase, itself protected by a cardboard box. With the card you also get a functional-but-cheap ASUS laser mouse, an extra-long Crossfire bridge, and a sticker. For the asking price this bundle is a little slim, and though the briefcase is definitely an impressive inclusion, we'd prefer a recent game or two thrown in instead.



like – idling at 52.4dBA and roaring under loads at 68.4dBA. We pinpointed the source of this high aural annoyance to the spacing of the fins in the copper heatsinks: they're simply too close for air to pass through unimpeded, which in turn forces the fan to spin faster to keep things under control. Temperatures are quite good however, idling at 39 degrees with a load of 64 – but Ares definitely has a mighty war-cry.

A valiant leader

The Ares is admittedly very nice in benchmarks. It returns a nice 3DMark score of P25340, zooms effortlessly through Crysis at an average fps of 61.22, and performs where we expected it to in Heaven. GRID refused to run at a resolution above 1280x1024, but irrespective of that issue the picture is clear: performance is great. Is it greater than two GTX480 cards? Not at

all. Is it cheaper than those two? Again, no, not really. But does it give you more geek cred than those? Oh yeah.

Unfortunately for all the quality on offer, the Ares doesn't overclock particularly well, only rising to 910MHz on the core and 1240MHz memory. Using the included SmartDoctor software allowed a voltage boost to 1.24V that gave an extra 12MHz of headroom, but this wasn't worth the hassle of running the truly terrible software. It even insisted on blaring a "Start initializing" message every boot-up, followed by "The System doesn't install ASUS GamerOSD!". Intrusive at best.

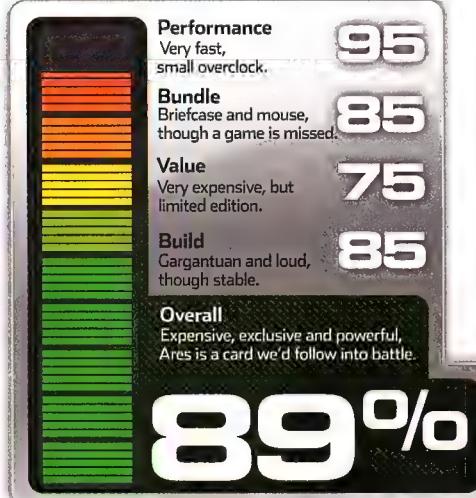
The Ares is a limited manufacturing run, and if you've got the cash to drop on one then you'll most likely be quite pleased with the card – though there are higher-performing combinations out there for the price, you can bask in the glory that comes from almost six kilograms of pure graphical win.  JR



ASUS ARES Synthetic Benchmarks



ASUS ARES Gaming Benchmarks



XFX 750W Black Edition

Back in black...and green.

Street Price \$185 Supplier Altech
Website www.altech.com.au

Specifications Captive: 24-pin, 8-pin ATX, dual 4-pin ATX, 2x 6/8-pin PCIe; Modular: 8x Molex (2, 3, 3), 9x SATA (3, 3, 3), 1x Molex > Floppy adaptor, 2x 6/8-pin PCIe; 80+ Silver certified

XFX impressed the last time we saw their neon-green juicebox, and that 850W model powered everything we threw its way without so much as a hiccup. They've come back with a slightly lesser-powered model, but one very much in the same vein as the bigger brother – and as we found, it doesn't drop much along the way. Returning is the same visual styling that will either make you fall in love or throw up slightly in your mouth, packing a bright green 140mm fan within an interesting casing. The case screws are even custom-shaped and pre-screwed into the unit, though the threading is not the standard gauge – so you won't want to lose them!

Cabling options are partially modular for neatness, though there's plenty on-hand to power two high-end graphics cards and a whole raft of peripherals – up to nine SATA and eight Molex at any one time. Showing the enthusiast

tilt is the inclusion of an effective two 8-pin ATX cables for powering motherboards that can handle extreme overclocking. The cables are sleeved very well, with heatshrink applied throughout the cables to keep them shapely and ordered. It's rated up to 744W with a huge 62A 12V rail, and is rated for 80+ Silver with an average 88 per cent efficiency. We didn't notice the unit heating up nor becoming audible in testing.

Loading up the unit with a high-end system highlighted the unit's exceptional performance, barely wavering from an idle of 12.069V to a load of 12.075V. This was repeated in a 5V shift from 5.183-5.208V, suggesting that nothing has been lost in the wattage department.

The 750W unit costs \$185, which is slightly more than other 750W models, but the five-year warranty and attractive test results promote it to the top of the pile. 



Overall
The perfect amount of power for most enthusiast rigs.

93%

Huntkey Jumper 550W

See the amazing jumping 5V rail!

Street Price \$95 Supplier Huntkey
Website www.huntkeydiy.com

Specifications Captive: 24-pin, 8-pin ATX; Modular: 7x molex (2, 2, 3), 7x SATA (2, 2, 3), 1x Floppy, 1x 8-pin PCIe, 2x 6-pin PCIe; 80PLUS certified

When you sit down to start piecing together a brand-new rig, the temptation to skimp on a few parts can be pretty strong. You might be browsing through cases online, and odds are that you'll see a few that come with a power supply – a whole unit, practically for nothing! Well, it turns out that there's a reason they can include a PSU with a case for a grand total of eighty bucks: both are generally shoddy quality and destined to explode with only the slightest encouragement. And that's if you're lucky!

Thankfully it seems you don't have to spend a huge sum of cash to get a decent unit, and the Huntkey Jumper 550W on display sits smack-bang in the middle of the Antec and Coolermaster competition. As its name suggests, it is rated by Huntkey for 550W, though it boasts the ability to supply up to 648W through the four 12V rails rated at 16A, 16A, 14A

and 8A. It's also only certified for 80PLUS, with an average of 82 per cent efficiency.

The included cables are mainly modular, though they are quite short in length and are appropriate for smaller ATX builds. There are six peripheral cables offering SATA and molex, but only four sockets to plug them into, offering a nice amount of choice. There's also enough PCIe connectors to run two decently-powerful graphics cards or a single high-end card.

We loaded the Jumper up with a workload and threw our multimeters at it, returning 12.153V and a concerning 4.4060V on the 12V and 5V rails respectively. There didn't appear to be any instability on the 12V rail, even though the 5V rail idled at anywhere from 4.6V to 4.75V, seemingly bouncing around at random. In all, the Jumper 550W is a decently priced unit that can power a mid-range system, and though we'd prefer a little more efficiency, it is certainly far better than a cheap bundled unit. 



Overall
Won't set the world on fire, but it's not bad either.

79%



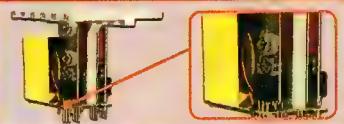
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Aerocool BX-500

Aerocool delivers a budget case with a mid-range price... whoops.

Street Price \$180 **Supplier** Aerocool
Website www.aerocool.com.tw

Specifications 480 x 215 x 568mm (H x W x D); 1x 120mm fan (front), 1x 120mm fan (rear), 2x 140mm fan (top); 5x 5.25in bays (inc. 1x convertible to 3.5in external), 5x 3.5in bays; 7x expansion slots; up to E-ATX motherboard; SECC construction.

We try not to make fun of the horrendous English we see in some ads and on many websites. In our business, it's inescapable – pointing it out at every opportunity is rude. But the press blurb for the Aerocool's BX-500 case is just too... inappropriate to ignore.

"The combination of aluminium and metal mesh, eludes 'Class' and 'Elegance'."

Elude. Meaning to escape or avoid. So, apparently, the BX-500 avoids class and elegance – is this some kind of Freudian slip, or is there more to this case than meets the eye?

Well, annoyingly... it's a pretty average case. Externally, the front metallic mesh panel is austere, highlighted only by two brushed aluminium strips that run from top to bottom – small enough that we almost missed them. The top panel's a little bit more interesting, with a solid power button, and push-to-open panel concealing a wealth of IO options, including four USB ports.

Behind the IO panel is a small recessed bay with a foam bottom – a handy tray for storing spare screws and small components without causing any rattle or vibration. The rest of the top panel is a mesh insert. The left-hand side-panel is similarly meshed, though not filtered, with space for four optional fans, and there's even a smaller mesh insert on the right-hand panel behind where the CPU mount would be – and the option to install yet another fan.

The rear panel's a touch ugly, being bare metal, and features four water-cooling grommets made from poorly formed rubber. It's... not inspiring.

Aerocool makes the bold claim that this is the ultimate case when it comes to cooling, and with the capacity to install up to ten fans there's something to that claim. But there's only filtering on the bottom of the case and the front, and with that much airflow you're asking for long term issues with dust build-up on important cooling components. Airflow is only half the battle when it comes to keeping a build running smoothly – clogged fans and gunk-covered heatsinks are going to kill your gear as fast as a lack of moving air.

The rest of the internals are a similar mixed bag. Everything's untreated metal in here and some of the surface seem a bit unfinished. Aerocool's gone the tool-less route for pretty much everything, too, but has managed to choose the worst of all possible options for the external bays (a flimsy slide mechanism), the HDD cages (pinch-in/pinch-out caddies with zero dampening), and the expansion bays (gripless push-button jobbies that we wouldn't trust with anything the size of modern high-end cards).

On the upside, the interior is roomy enough, and with clips for cable runs there's at least a nod to making sure you've got unimpeded airflow. The space between the mobo plate and the side panel is a bit tight, though.

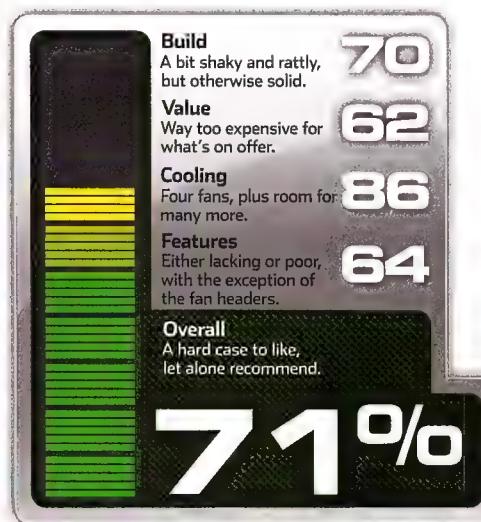
Arguably the best innovation in the case, however, are the two sets of PCB mounting fan plugs and molex adapters. There's nothing worse than trying to stretch fan cables to the often



arbitrary mounting points on various mobos – this solution means the cabling's not only neat and out of the way, but makes swapping out an old board that much faster and easier.

Oh, and the included fans feature orange LEDs, which you'll either love or hate.

It's a mixed bag, the BX-500, and we can't help but think Aerocool really does have it wrong. At an asking price far in excess of the similarly specced ThermalTake BlacX, this case isn't really all that classy, nor all that elegant. If you really must have a metric buttload of fans whirring away in your case, then this might serve, but the truth is you'll find better gaming boxes for less money without expending too much effort.  DH



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Thermaltake V9 BlacX

Drop it like it's hot... swappable.

Street Price \$138 **Supplier** Thermaltake
Website www.thermaltake.com

Specifications 215 x 490 x 480mm (W x H x D); 1x 140mm fan (front intake) 1x 120mm fan (rear exhaust); 1x 230mm fan (top exhaust) 3 x 5.25in drive bay (external); 2 x 3.5in drive bay (external); 5 x 3.5in drive bay (internal); ATX, M-ATX; Steel construction; 6.85kg

Gallery www.atomicmpc.com.au/?230056

Thermaltake is no stranger to creating cases, and its V9 BlacX is the one it's betting the farm on for the rest of the year – packing it with its bestest features but keeping the price underneath \$140. We saw it recently at Computex (www.atomicmpc.com.au/?218727), but it appears that the case has changed little since that early showing.

Front-on the V9 isn't too visually exciting, boasting a plastic baffle at both sides of the meshed fascia, behind which lies a single 140mm blue LED intake fan. While it is nice to see blue for a change, this was an odd choice considering the rest of the case is black and red. The real excitement about this case rests up on top of this rather average area, where the 'BlacX' sit. These are Thermaltake marketing-speak for 'hot-swappable HDD caddy', and one or two hard drives can be thrown in at any time for easy data transferring. It's a practical way to share completely legally-obtained game trailers and other content when at LANs!

The caddies are powered by molex and SATA internally, meaning they're technically compatible with SATA3.0 – assuming you've got the internal ports free. It's also technically compatible with USB3.0, even going so far as offering a port on the I/O panel. Of course, to achieve this without a ratified USB3.0 internal

header standard, Thermaltake has simply strung an extension cable through the middle of the case, exiting through one of the two watercooling grommets that no-one ever uses, where it ultimately plugs into the motherboard's rear I/O panel. And again, the cable is bright blue so it looks like it belongs like a grizzly bear looks like it belongs in a day-care centre.

Internally the case improves somewhat, with lots of ventilation provided by the three included fans and numerous honeycomb grilles stamped into the sidepanels, though only the power supply has a dedicated dust filter. Everything is toolless for quick installation, using red clips that work with the black colour (not, you know, blue or anything), but there's no vibration dampening. The interior is painted a nice black, but the paint has a very noticeable texture to it and is annoyingly reflective up-close. It's also a gigantic fingerprint magnet, though this might not be an issue given enough time to build up a coating of finger grease.

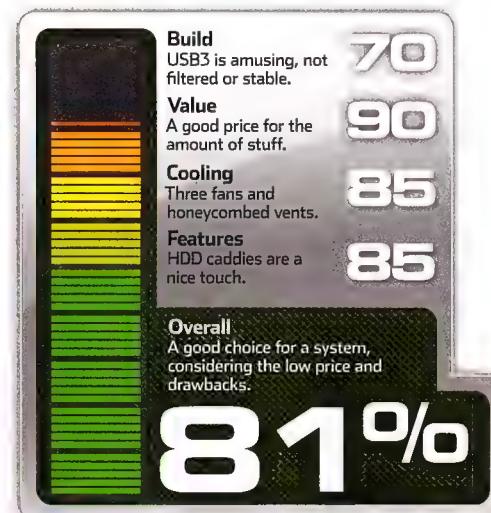
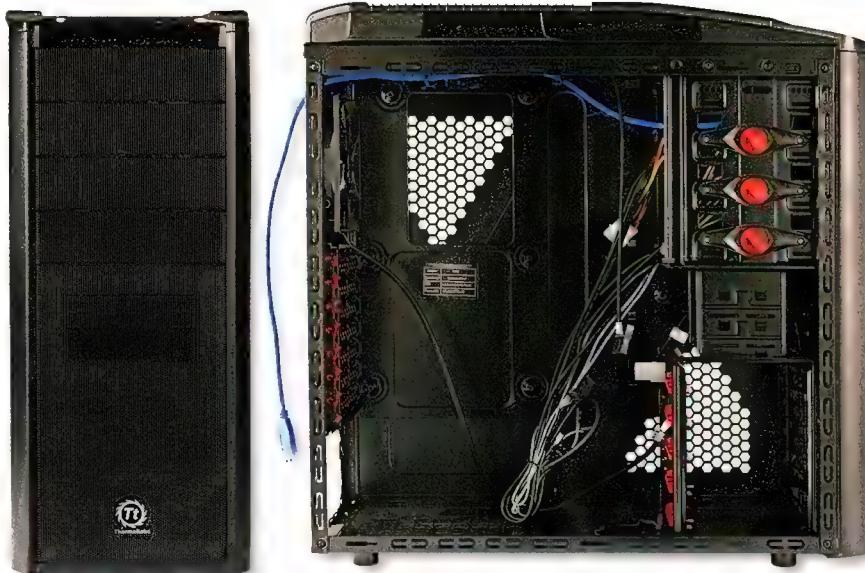
Another problem we noticed was room for neat cabling – there isn't any. Spacing between the right-hand sidepanel and the motherboard tray is closer than this year's federal election, making it impossible to wedge even a 4-pin ATX power cable behind there, let alone SATA or molex.

As another plus the case is roomy enough for longer power supplies and can fit even the venerable 5970's massive bulk, but as yet another counterpoint, the V9 can't handle CPU heatsinks over a height of 165mm. Thankfully it should still handle tall coolers like the Noctua NH-U12P comfortably, though it's something to keep in mind.



It might not be such a good idea to fill the V9 with the heaviest hardware you can get your techy mitts on, however, as the stubby plastic feet the case precariously balances on offers neither firm grip nor excellent stability. Probably won't be a problem for most system builds, but it's definitely a thing to watch out for when thinking about where you'll sit the case – marble benchtops are a definite no-no.

In all, the V9 does save you some cash if you're the type to ever hot-swap harddrives, and it does have plenty of airflow for the high-performance enthusiast – whether or not we can live with its flaws is a decision that's hard to make.  JR





gamescom 2010

Cutting edge

We caught up with Razer's Chief of Products, Chris Mitchell, at Gamescom and got to grill him about Razer's new Starcraft II range, the state of pro-gaming, and more.

Razer was showing off a whole swathe of products at the recent Gamescom show in Europe, and was nice enough to send us over so we could get an advance hands-on of the new gear. We also got a chance to chat to one of Razer's design team, Chris Mitchell.

The big thing that Razer announced at Gamescom was the new Blackwidow keyboard. It's about as high-end a gaming product as you're ever likely to see – a mechanical, pro-grade gaming 'board that comes in Standard and Tournament varieties. And even the standard one is pretty damn fancy.

"This is only our third keyboard in 12 years, so we wanted to make something special," said Min-Liang Tan, Razer's CEO and Creative Director, at the launch. "And it's been made with

the help of some of the best pro-gamers in the world." It certainly looks the part, and is feature-rich to boot.

He added to this proudly, "And when we say we work with real pros, we meant it – we don't just get some dudes to sign our gear and take a sponsorship."

Since Razer really takes that pro relationship seriously, we thought that the best place to start in our chat with Chris.

"At the very core of our product philosophy is that we want to give our users a competitive edge," Chris told us when we asked him about the importance of the pro scene. "Winning is everything for us, and that's why pro-gamers are very, very valuable for us. These are the guys who have the highest requirements in terms of peripherals."

Razer works hard to make sure those requirements are met, too, by consulting a lot of the big pro-gaming teams about what they want in a product – or don't want. "They are very valuable to us," Chris added. "They allow us to make better products."

He admits, quite readily, that most gamers are never going to get the same out of a mouse or keyboard as someone operating at the international level. Hell, we probably use more mice and keyboards than a lot of people during our review process, and we're far from the kind super-i33t types who live and die by the travel distance on their favourite keyboard.

But there's an aspirational angle to using pro-grade gear. Chris says "You can at least aim high when you know you're using the same mouse as a tournament winning player."

Being so closely involved with the pro gaming scene, but still standing at a distance, also means that Razer and its team had a unique opportunity to really see the ebb and flow. "When it started, and especially around 2000,



it was really growing too fast," Chris feels. "It was trying to grow faster than it could actually sustain – and a lot of big tournaments didn't make it. It's the ones who started slow and let themselves grow naturally that have made it and are still running well now."

Another thing that Chris is starting to see is the growth of console leagues. "In the beginning it was just too much effort to get that kind of thing going, but now most consoles are online so it's a lot like the PC market. It's getting really big in the US – there's a lot of growth potential in console professional gaming."

Which is not to say that pro PC gaming is falling by the wayside. What Chris is really impressed by is the growing professionalism of the big teams – not in a kick-your-arse gaming sense, but in being able to project a cohesive brand and nurture their own players.

"When we first started sponsoring teams, it was like five friends who liked the hobby and were good at it," he said. "Now these are dedicated companies, much more like pro





sports teams - they do PR, they do marketing. You'd never see that ten years ago, and it helps the market grow."

More interestingly, it makes the gaming scene more tempting to bigger, non-gaming clients. In fact, Volkswagen was at GamesCom, sponsoring a large Intel tournament. A car manufacturer has nothing to do with gaming, of course, but if they see as at worth investing in, the scene must be doing something right.

Big in Korea

Of course, if you're talking up pro-gaming, and you're launching a range of dedicated Starcraft gear, it's impossible to not talk about the South Korean market. So why fight it?

"When we designed the Starcraft 2 peripherals, there were three parties involved," Chris told us when we asked him about the importance of Korean influence. "One is Blizzard, who provided a lot of design inspiration, another is our own internal design and ergonomics, and then the third would be the pro Starcraft players."

"And, obviously, the best Starcraft players are in Korea."

Once Razer understood it was pretty much that simple, and that Starcraft 2 was, in many ways, just like Starcraft before it, the company simply looked at how Koreans played the original game and went from there.

So, largely, the design ethos is about a mouse light enough to grip with thumb and little-finger, leaving the other fingers free for dazzling

amounts of actions per minute - and it is going to be, mostly, a smaller hand doing those clicks. Lateral mouse movement in Starcraft games is also important, a smaller mouse means more room to move it - and that also ties into the keyboard.

It's got higher-set keys and a much longer travel distance on all the keys, and despite being a full-size 'board in terms of keys, it's got a much smaller footprint - again, so you've got more room for mousing.

All of the gear is also fully styled to match that Starcraft II look and feel, though not a direct match-up to the named Terran units. The three flowing stripes on the mouse, for instance, match the stripes on the Terran rifle used by its Marines.

But one thing we were curious about, given the downsizing of the mouse and keyboard, is why the headset is so chunky.

"Well," Chris admitted, "it has to

be like that - when you light a headset like that, you've got to run extra cables, and then you need more space, and then..."

You get the picture. Finally, we asked him what it was like working so closely with Blizzard. It was a vexing question, and Chris might have squirmed just a little.

"It's tough, really tough - but not in a bad way!"

"You see, they push you," he went on to say. "They want the best products, of course, and so do we, so in the end I think we worked together [well] to make some great gear."

We can't argue - we're really looking forward to getting hold of it all for a full review.

Keep an eye out for the next issue, with the second part of our catch up with Razer. We'll talk about the new Onza Xbox controller, and of course the mighty Blackwidow keyboard.  DH



NAS boxes

Antony Leather dives into the world of Network Attached Storage devices to find you the best place to store your prOn. We mean... files...

Apart from SSDs, storage isn't usually considered to be a very glamorous or exciting subject. However, it's an essential part of the environment in which PCs operate, either on their own or on a network. With hard disks offering huge capacities these days for not a lot of cash, making sure that all your personal data – be it videos, photos or documents – is available to any PC on a home network all the time can be a tricky process.

One option is to leave your PCs constantly running or to create a dedicated file server. However, this can use a lot of electricity and take up valuable space. Another option is to buy a Network Attached Storage box, or NAS for short. If you've dismissed them as products in which only network would be interested, keep reading – they could be just what you need to share data on your home network, as well as being useful in other ways.

One of the best things about NAS boxes is that they're smaller than a shoebox and consume a fraction of the power of your average PC. The latest models can also function as FTP and iTunes servers; some even have built-in Bit-Torrent clients and function as media streamers as well.

In addition, if a NAS box has two or more drive bays, it usually offers RAID1 mirroring, so if one hard disk fails, your data will be safe, having been copied onto the other hard drive in the RAID array.

To help you sift through the choices, we've spent this month testing eight dual-bay NAS boxes. Our goal is to find the fastest and most feature-laden examples currently on the shelves, and to highlight which, most importantly, are the easiest to work with.





How We Tested

Any device connected to a Gigabit LAN will have maximum read and write speeds of 125MB/sec. However, just as the controller chip on an SSD has a huge effect on how fast a drive

is, the same is true for NAS boxes. As they'll be used for storing lots of tiny files as well as large video files, in order to see how flexible each box was, we used two 5GB folders (one full of small files and the other packed with large video files). Our test involved writing to then reading from each NAS box separately.

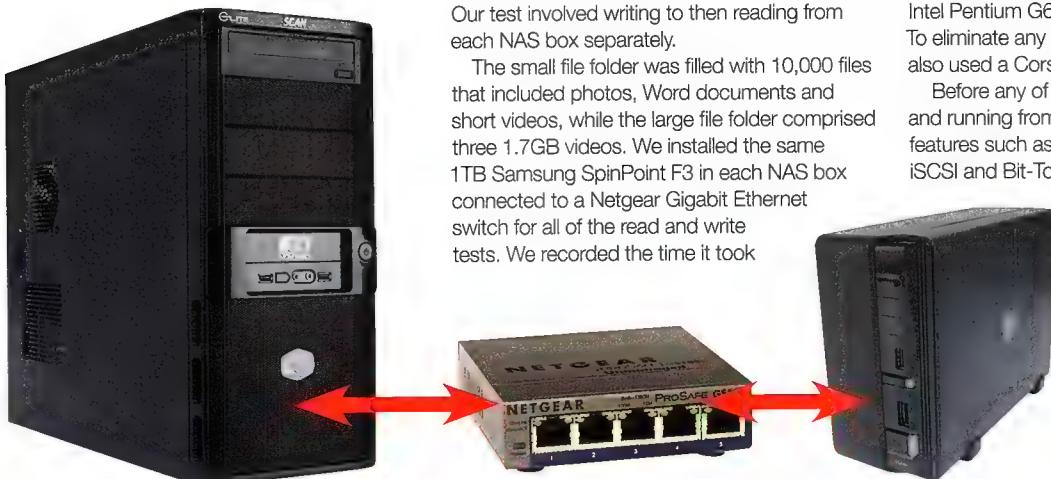
The small file folder was filled with 10,000 files that included photos, Word documents and short videos, while the large file folder comprised three 1.7GB videos. We installed the same 1TB Samsung SpinPoint F3 in each NAS box connected to a Netgear Gigabit Ethernet switch for all of the read and write tests. We recorded the time it took

to transfer each folder in seconds, and used this result to work out the average transfer rate.

To read and write from the NAS box, we used a PC built around an Asus P7H55-M motherboard, 4GB of Crucial DDR3 RAM and an Intel Pentium G6950 CPU overclocked to 4GHz. To eliminate any reading or writing bottleneck, we also used a Corsair X128 SSD.

Before any of that, we got each NAS box up and running from scratch and tried out all the features such as shared folders, iTunes servers, iSCSI and Bit-Torrent clients to see just how

easy they were to set up and use on a regular basis. In addition, we also took into consideration how noisy each was as well as how cool they managed to keep the hard disk, and how well built they were.



Anatomy of the NAS box

A Network Attached Storage (NAS) box differs from an external hard disk in several ways. Firstly, it has an Ethernet port (and/or WiFi) and can therefore be connected to a router, hub or switch and be accessed by any PC or laptop connected to the network.

Secondly, it can function independently of a PC, so unlike an external hard disk, it can be left on 24 hours a day without the need for a PC to act as a network go-between. Some NAS boxes can perform many of the same functions as a PC or media server, while using less power and taking up less space, so there's an increasing argument for using a NAS box instead of a small PC or home server. In fact, most NAS boxes are essentially just low-power PCs, with CPUs and upgradable RAM.

Most NAS boxes are highly configurable, typically via a web interface. This means that you can configure the NAS box from any PC on the network, usually without the need to install any software. Nearly all NAS boxes have other inputs such as USB 2 or eSATA ports.

Printers, USB sticks and memory card readers can then be shared on a network and USB mass storage drives can be backed up to the NAS, often at the touch of a button. Most NAS boxes include FTP server abilities, allowing you to access your data remotely. They can also include integrated Bit-Torrent clients, meaning that it's possible to download torrents without the need for a PC. Two-bay NAS boxes usually offer the redundancy of RAID1 too.

Some NAS boxes also support USB wireless dongles, only requiring a power socket to work. They operate with Ethernet over power

adaptors too, so that it's possible to keep your hard disks somewhere out of the way such as a cupboard or shed. This is an excellent idea, as it means that if your PC is stolen, you won't lose all your data too. A NAS box is also worth considering if you're keen to

get rid of the noisy hard disks from your PC in favour of a silent SSD, but still want to be able to access lots of data.



Alternatives to NAS boxes

The main benefits of NAS boxes over fully fledged file serving PCs are that they're smaller and use a lot less power. They're usually quieter and cheaper too, but as we found with many of the models we reviewed, they're often not a lot cheaper than building your own media server – especially as none of the examples we reviewed included a hard disk. Setting them up and using all their features isn't always as easy or as flexible as working with Windows either – especially if you haven't used one before. So what are the alternatives?

Build your own media server from scratch

Using a mini-ITX or micro-ATX motherboard with a laptop optical drive would allow you to use a case that isn't much bigger than some of the NAS boxes we look at this month. Mini-ITX motherboards with integrated Intel Atom CPUs are cheap as chips, so a system including a copy of Windows 7 or Home Server shouldn't cost much more than a few hundred before you've bought your hard drive. This is a lot less than the Synology DS210+, the most expensive NAS box on test.

Windows 7 and Windows Media Center

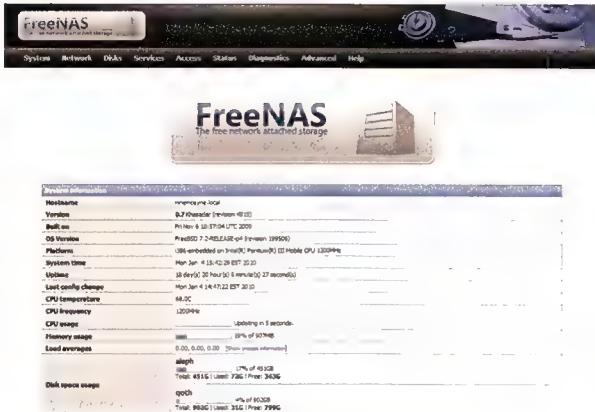
Using Windows has its benefits too. As most NAS boxes use proprietary operating systems, if the NAS box dies, you won't be able to access your data from a Windows PC. Instead you'll have to buy another NAS box that uses the same file system. If your PC fails, you can at least get at your data and recover it using another PC. Fully fledged Windows Bit-Torrent applications are generally far more configurable than the basic Bit-Torrent clients that are included with many of the NAS boxes we tested.

Windows Media Center works brilliantly with flat-screen TVs or monitors and can turn your PC into a media player for easy access to photos and videos as well as providing a means of playing optical discs.

Windows is also compatible with the vast majority of media streaming protocols and network music players such as Logitech's Squeezebox, while the extra processing power available even from a lowly Intel Atom-based system means that reading and writing files won't be hampered by a slow CPU – as is the case with many NAS boxes.



Windows Media Center.



Windows Home Server.



FreeNAS.

Windows Home Server

This goes one step further than Media Center, combining the simplicity and automation of a NAS box with the flexibility and power of using a Windows PC.

A PC running Windows Home Server is instantly accessible by any PC on the network using a console that provides easy control over shared folders, backups and remote access.

Windows Home Server connects directly to Media Center on other PCs and allows for media sharing as well as synchronisation of popular folders such as pictures and music. In addition, there are hundreds of add-ons which provide other features such as UPnP/DLNA and Squeezebox media streaming support as well as plug-ins for popular Bit-Torrent clients such as uTorrent.

There's also dedicated support for video surveillance, Windows Mobile and iPhone integration, and with Windows at its heart, you can run any kind of program you would normally use without any fuss too.

FreeNAS

If you're looking to keep costs to a minimum and avoid having to pay for a copy of Media Centre or Windows Home Server, then FreeNAS is certainly worth a look. It's a free Unix-like, open-source NAS operating system. FreeNAS turns any PC into a highly capable NAS box with features similar to those of modern NAS boxes, all configurable via a web interface.

There's iSCSI support and practically any method of streaming media is supported too as well as DLNA/UPnP and iTunes servers. FreeNAS isn't just compatible with Windows either; Apple Mac OS X, Linux and FreeBSD all work with FreeNAS too.

You'll be happy to hear that it's not too tricky to set up either, and there's an ISO image available from <http://freenas.org> that installs in much the same way as Windows.

As with Windows Home Server, there's an excellent community that provides support as well as countless add-ons. The real benefit, though, is that you only need a tiny amount of processing power to be able to use it, and FreeNAS can run from a USB stick or compact flash card. However, it isn't quite as quick and easy to work with as a Windows-based server.

Edimax NS-2502

Very cheap, but this value-priced NAS box struggles with lots of small files and has poor cooling.

Street Price \$240

Manufacturer www.edimax.com

The Edimax NS-2502 is one of the cheapest NAS box in this Head2Head. It feels cheap and tinny, and there's a single tiny 40mm cooling fan. Bizarrely, this is located in the base of the unit instead of the rear (as it is in the others on test).

With the stand attached, there's barely any room for air to be drawn in to cool the hard disks and air also has to pass through several 90-degree turns before it even enters the case. As a result, our single hard disk rapidly became very warm, so we'd be dubious about installing another disk for JBOD, RAID1 or RAID0 support.

We initially had to perform a slow full format of the hard disk before we could access it via the web-based user interface. You'll also need to fiddle around in the settings a little, enabling anonymous user access before you're able to view and use shared folders and access USB drives. Memory card readers are supported, as well

as USB sticks using its two USB 2 ports.

Setting up the Edimax was tedious, with a considerable amount of work required to enable even its most basic functions. However, services such as the FTP and iTunes servers eventually worked without any issues. The Edimax also supports the UPnP and DLNA protocols, so it's able to talk to compatible media streamers and consoles. If you want to leave it on all the time, it only draws a paltry 12W.

In our large file transfer test, the Edimax gave a poor showing, managing a write speed of only 11.6MB/sec compared to the 20MB/sec average of the better NAS boxes. It fared a little better in the read speed test with a transfer rate of 21.1MB/sec, which was about average. However, in the small file test, Windows kept returning error messages while trying to copy the folder.

We thought that maybe our PC or switch was faulty, but all the other NAS boxes completed this test successfully. We can only assume that the Edimax just can't handle lots of small files, which is very poor indeed.



Overall

Not worth the time or the effort.

24%



The ZyXEL NSA-220 Plus looks appealing and has solid build quality. Installing hard disks isn't too tricky, although there aren't any swappable bays. Instead, the rear of the unit unscrews from the case and sliding drive bays are used to hold hard disks in place.

The NSA-220 Plus includes well-written instructions, although strangely we found that the only way to access shared folders on volumes created in the web interface was

to map them as network drives. We had no cooling complaints, with the NSA-220 Plus staying quiet while keeping our hard drive from overheating.

The web interface is particularly basic compared with the Synology and QNAP NAS boxes, but it was still clear and straightforward. You're even able to check the temperature of the CPU and status of features such as the FTP and media servers. The iTunes server was easy to set up and there's DLNA support for compatible media streamers.

Backup is provided by Memeo, which should eliminate the need to buy additional software.

There are two USB 2 ports located on the front of the case, and the one-touch backup button works well. The web interface allows you to allocate specific folders for USB backup, as well as transfer data to USB sticks.

The NSA-220 Plus is equipped with just a paltry 64MB of RAM and a 500MHz Marvell

ZyXEL NSA-220 Plus

Slow and not very well featured, given its price.

Street Price \$380

Manufacturer www.zyxel.com

5182 CPU, so we didn't have especially high expectations in the speed tests compared with the NAS boxes from Synology.

The ZyXEL didn't score highly and wrote at a very poor 4.5MB/sec in the small file test. When writing the large file folder, the NSA-220 Plus was the slowest, with a write speed of just 9MB/sec.

Coming at the bottom of our Speed test for video files isn't something to be proud of. The NSA-220 Plus is quiet, well made and easy to use, but suffers from a severe lack of speed and features compared with other similarly priced NAS boxes.

Overall

Slow video results mean you should look elsewhere.

49%

Thecus N2200

A sturdy, relatively inexpensive NAS box that's let down by poor transfer speeds.

Street Price \$200

Manufacturer www.thecus.com

Given its low price, we had high hopes for the Thecus N2200 and our first impressions were very good indeed. It's sturdy, quiet and well made, with strong hot-swappable drive bays hidden behind pop-open doors. While it remained relatively cool and quiet throughout testing, the array of flashing lights on the front fascia could be annoying to have in front of you for extended periods.

Installation is quick and all the shared folders you need for basic use are created automatically. These don't appear in your network folder by default, so you'll need to map them to your PC. There are four USB 2 ports, with one on the front of the case next to a one-touch backup button.

The web interface is appealing and easy to use compared with other similarly priced NAS boxes. However, it was laggy compared with the snappy interface of the Synology.

Enabling an iTunes server was relatively straightforward, and you're also able to

change MP3 tags. UPnP and DLNA compatible media streamers are catered for, with support for both protocols, and it's possible to create FTP and print servers too.

An additional software module is required for Bit-Torrent support. There are also plug-ins available for Internet Explorer and Firefox which can capture Torrents (as well as other types of files) and automatically start downloading them.

The Thecus uses a lowly 376MHz Oxford 810DSE CPU, but while it has 256MB of RAM, it has just 4MB of flash memory. This lack of horsepower manifested itself in the second slowest read speed in the large file test – the N2200 managed just 14.9MB/sec. The fastest we saw it transfer was 15.8MB/sec during the large file write test – still not very impressive.

Apart from its snail-like read and write speeds, the N2200 is an appealing NAS box. Impressive build quality, versatility and whisper-quiet operation all count in its favour. However, nobody

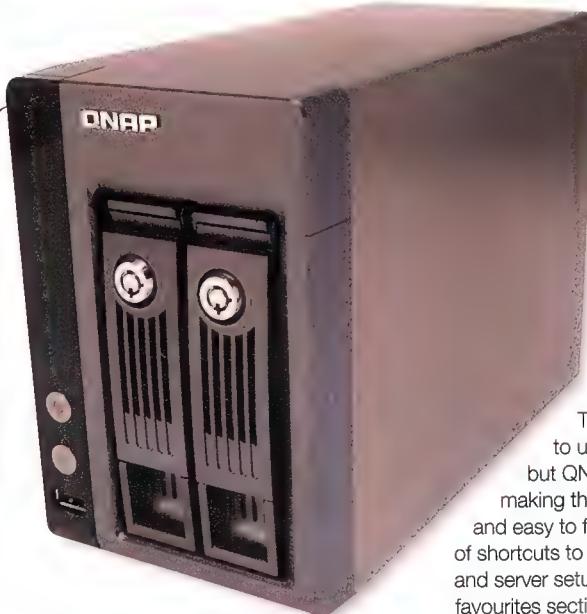


likes sitting around twiddling their thumbs while waiting for a machine to finish its job, and unfortunately, you'll be doing a lot of that with the N2200.

Overall

A let down where it counts the most, but otherwise good.

55%



The QNAP TS-219P is a beefed-up version of the TS-210 (reviewed over on p58) with a fast 1.2GHz Marvell CPU and 512MB of DDR2 RAM.

It has hot-swappable drive bays, two eSATA ports, support for 2.5in hard disks and a few extra RAID-specific features over and above the TS-210, which goes some way to justifying the fact that it's much more expensive. Build quality is admirable, although

QNAP TS-219P Turbo NAS

Easy to use and bristling with features.

Street Price \$560

Manufacturer www.qnap.com

it's not as impressive as the Netgear ReadyNAS Duo RND2000.

Happily, it has the same brilliant web interface as the TS-210, though, which is a dream to use. There are lots of features, but QNAP has done an excellent job of making the web interface clear. It's quick and easy to find what you're after, with plenty of shortcuts to popular functions such as RAID and server setup listed on the home page in a favourites section.

Setting up the TS-219P was a breeze. There's full iSCSI support, which allows you to allocate portions of an existing volume as iSCSI targets, and setting up the file and media servers is mostly a one-click affair, with the TS-219P appearing instantly in iTunes' shared folder once we'd enabled the iTunes server. There's support for UPSs and video surveillance cameras too. The TS-219P also has an excellent user forum on QNAP's website that offers in-depth guides

on many features, as well as downloads of third-party plug-ins.

The TS-219P was very fast in all the speed tests, achieving second place in three of our four tests. For example, it produced an average write rate of 27MB/sec in the large file test and 17.6MB/sec in the small file test. However, these impressive results still weren't enough to prevent it from being trounced by the Synology box.

The TS-219P is a very good NAS box, with a good blend of easy-to-use features, performance and an active online community. But there are better choices in this round-up...

Overall

Very good, but very costly.

74%

Netgear ReadyNAS Duo RND2000

Superb build quality, quiet and easy to use.

Street Price \$250

Manufacturer www.netgear.com

The Netgear ReadyNAS Duo RND2000 is available with or without hard disks, and has a reputation for being reliable, well made and very well supported. There are also plenty of Netgear and user-created add-ons available, which both improve existing features and add new ones to an already impressive spec.

Had we included a test that involved dropping NAS boxes from our fifth floor window, the RND2000 would almost certainly have come out on top – it's a damn tank! In fact, it was so heavy that we thought it already had two hard disks inside. At the rear is a 60mm fan, which is extremely quiet and effective. The sturdy construction combined with padded feet meant that it suffered from hardly any vibration. Installing hard disks is easy, as each drive is mounted in a hot-swappable caddy.

There are a total of three USB 2 ports, which support printers, USB sticks and memory card readers. The one-touch backup button on the front of the case works

particularly well, creating shared folders for the data from your USB stick or memory card reader.

The web interface is easy to use, but it looks dated compared with those used by QNAP and Synology. An integrated backup manager can be configured to automatically synchronise files on your PCs with those on the RND2000. A Bit-Torrent client is included, which also includes support for port and speed control. While the RND2000 lacks iTunes server support, it supports the DLNA and UPnP protocols. It can also function as a Logitech Squeezebox-compatible server, eliminating the need for a PC when using Squeezebox media streamers.

The ReadyNAS Duo's dated feel reared its head in our speed tests though. While it matched the speedy Synology NAS box in the large file read test, managing 38MB/sec, it struggled in the write test and both small file tests. In the small file write test, transfer speeds dipped to just 10.2MB/sec.

The ReadyNAS Duo is a capable, sturdy and attractive NAS box, but it's not the final word.



Overall

A solid effort from Netgear, but old-fashioned in places.

77%



QNAP has a long-standing reputation for making excellent NAS boxes so both the TS-210 and TS-219P had a lot to live up to. The cheaper TS-210 has an 800MHz Marvell CPU while the TS-219P is equipped with a 1.2GHz processor. The TS-219P also has twice the amount of DDR2 RAM – 512MB as opposed to 256MB here, although both models have

QNAP TS-210 Turbo NAS

Very easy to configure, but it lacks pizzazz in the speed department.

Street Price \$330

Manufacturer www.qnap.com

16MB of flash memory.

Although both QNAP NAS boxes use the same web interface, physically, they're very different. In short, the TS-210 is pretty much a no-frills NAS box with three USB 3 ports, while the TS-219P has hot-swappable bays and all sorts of other extras. The build quality of the TS-210 is good, and its 60mm fan is extremely quiet.

The web interface is a dream to use and second only to that included with the Synology NAS. It's well laid out and configuring each of its features is straightforward. This is an important factor, as there are so many features that it's easy to get lost. The home page includes links to popular features such as FTP and iTunes server setups, and the download station.

The TS-210 also includes good support for Bit-Torrent downloads, and most features have URL links to the extremely helpful QNAP forums and Wikipedia pages if you need tips on how to get them working. Even with all these options, the web interface stays snappy and responsive.

This particular NAS box also makes a big

song and dance about iSCSI. This feature allows you to allocate portions of an existing volume as targets.

In the speed stakes, the TS-210 lagged behind the more expensive TS-219P and Synology NAS boxes in all the tests. However, it was still streets ahead of most of the other NAS boxes. For example, it averaged 35.4MB/sec in the large file-reading test.

The TS-210 is an excellent example of how easy a NAS box should be to configure and use. It's only let down by its unexceptional transfer rate.

Overall

Average performance, but great features and ease of use.

79%

Synology DiskStation DS210+

Very expensive, but also incredibly fast and easy to use.

Street Price \$640

Manufacturer www.synology.com

The Synology DS210+ is by far and away the most expensive NAS box we've tested, and at \$640, we were surprised that it didn't include any hard disks. However, as it turns out, the DS210+ is able to justify its incredibly high price.

Its extremely quiet 70mm fan did a great job of keeping our hard disk cool and it was fairly easy to set up. What really impressed us, however, were the instructions – they're very easy to follow, with all the stages impeccably documented. Installing hard disks is accomplished by removing half of the fascia, which is easy enough, although the fascia does flex a lot more than we'd expect for a NAS box costing this much. There are three USB 2 ports, an eSATA port and even support for WiFi dongles.

The web interface is a dream to use, with six common tasks listed as favourites on the home page. The list of features the DS210+ supports is almost endless; the backup feature even has the option of using Amazon's S3 backup service. As well as iTunes, it supports Logitech's Squeezebox, as well as DLNA/UPnP



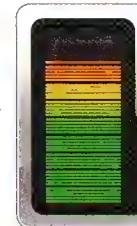
compatible media streamers.

With iSCSI support, you're able to configure all or portions of volumes as iSCSI drives, which appear on your PC as local disks, after you've initialised and formatted them in Windows.

The DS210+ has one of the more advanced Bit-Torrent clients we've seen too. You can even save data from video surveillance cameras and access the live video feeds via an iPhone app.

With a 1.06GHz Marvell processor and 512MB of DDR2 RAM, it came as no surprise that the DS210+ was a particularly fast NAS box. In both write speed tests, it annihilated every other NAS box. It was nearly twice as fast as its nearest competitor, the QNAP TS-219P Turbo NAS, with a stonking write speed of 51.3MB/sec. It was also the only NAS box in our test to top 20MB/sec in the tortuous small file write test, with a write speed of 27.1MB/sec.

The DS210+ is ridiculously fast, but more importantly, it's easy to use.



Overall

A killer combination of speed and features.

82%

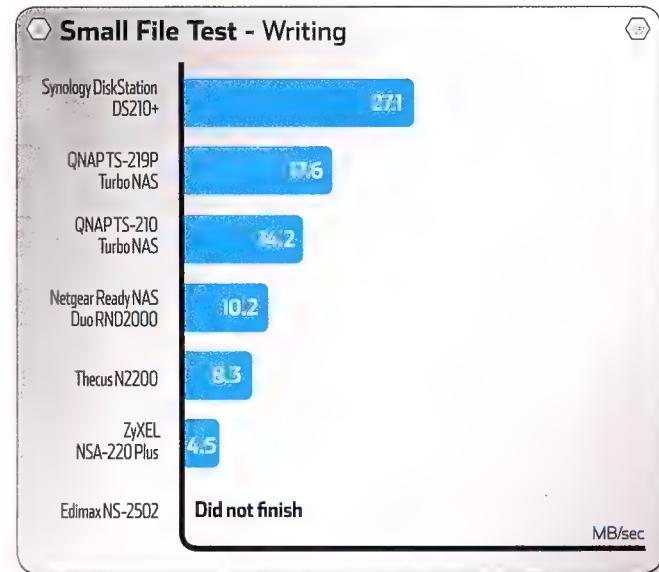
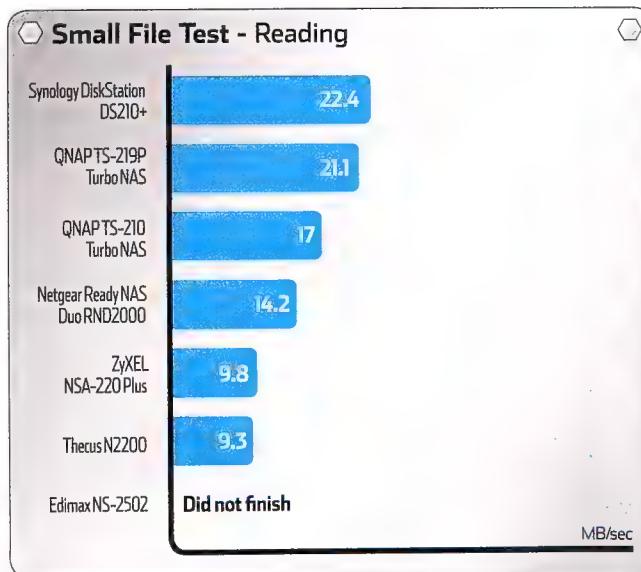
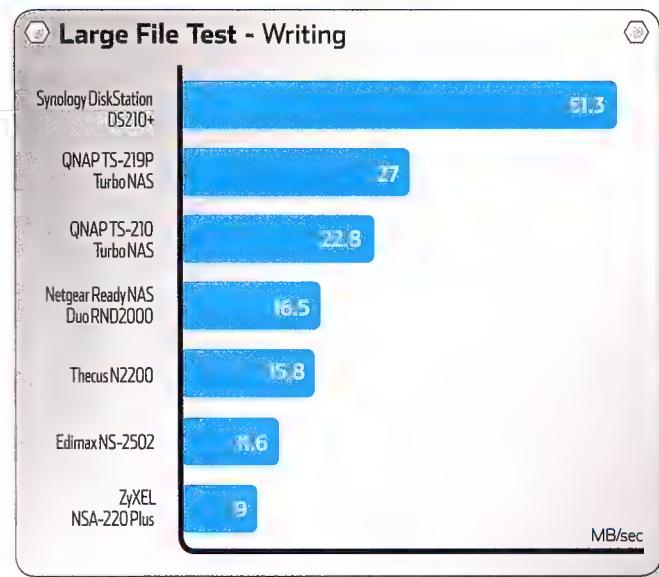
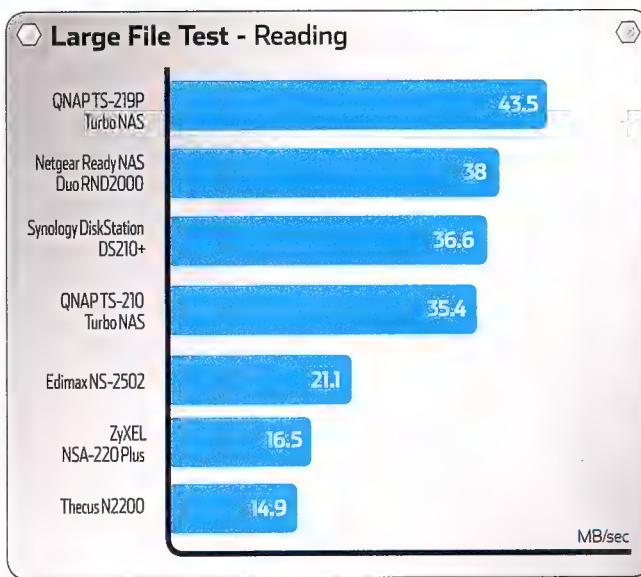
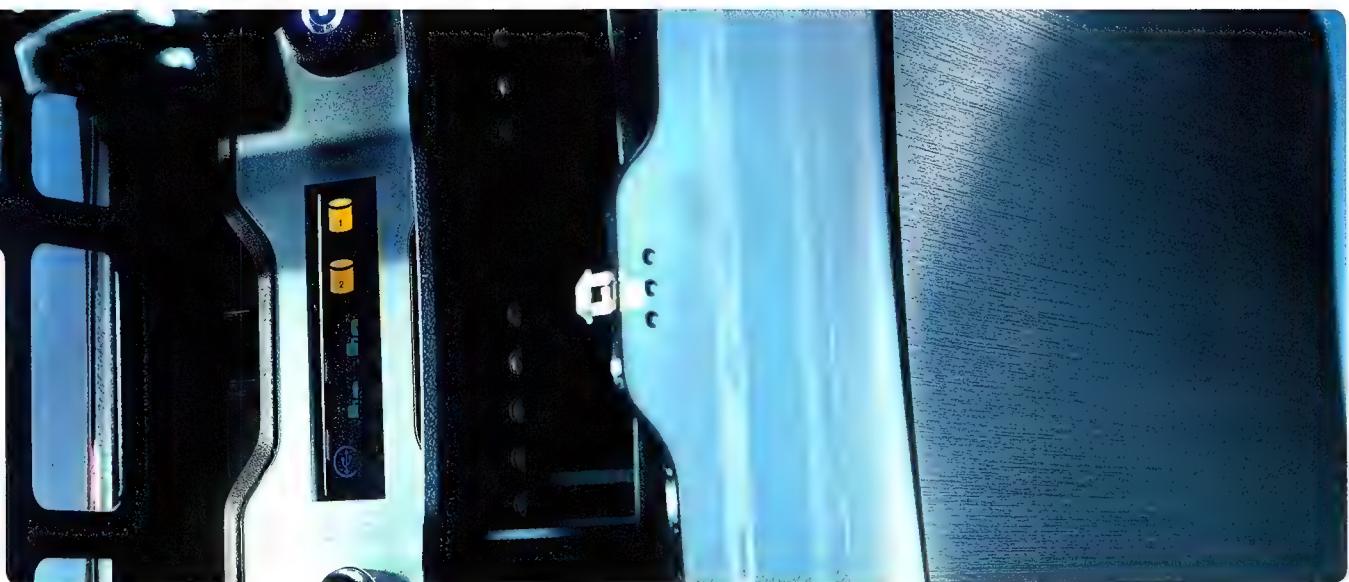
ON SALE NOW





Feature Table

	Edimax NS-2502	Netgear ReadyNAS Duo RND2000	QNAP TS-210 Turbo NAS	QNAP TS-219P Turbo NAS	Synology DS210+	Thecus N2200	Zyxel NSA-2200 Plus
Price	\$240	\$250	\$330	\$560	\$640	\$200	\$380
Manufacturer's website	www.edimax.com	www.netgear.com	www.qnap.com	www.qnap.com	www.synology.com	www.thecus.com	www.zyxel.com
Key specifications							
Drive bays (hot swappable)	2 x 3.5in (✓)	2 x 3.5in (✓)	2 x 3.5in (✗)	2 x 3.5in, 2 x 2.5in (✓)	2 x 3.5in, 2 x 2.5in (✗)	2 x 3.5in, 2 x 2.5in (✓)	2 x 3.5in, (✗)
Ports / other	10/100/1000 LAN, 2 x USB 2	10/100/1000 LAN, 3 x USB 2	10/100/1000 LAN, 3 x USB 2	10/100/1000 LAN, 3 x USB 2, 2 x eSATA	10/100/1000 LAN, 3 x USB 2, eSATA	10/100/1000 LAN, 4 x USB 2	10/100/1000 LAN, 2 x USB 2
Dimensions (mm) (W x D x H)	77 x 165 x 190	101 x 222 x 142	85 x 218 x 165	102 x 216 x 150	88 x 218 x 161	115 x 210 x 140	113 x 202 x 142
Features							
FTP server / print server / BitTorrent client	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓
Media Streaming support	iTunes, UPnP, DLNA	UPnP, DLNA, Logitech Squeezebox	iTunes, UPnP, DLNA	iTunes, UPnP, DLNA	iTunes, UPnP, DLNA, Logitech Squeezebox	iTunes, UPnP, DLNA	iTunes, UPnP, DLNA
iSCSI	✗	✗	✓	✓	✓	✗	✗
One-touch backup / backup software	✓/✓	✓	✓/✓	✓/✓	✓/✓	✓/✓	✓
RAID modes supported	0,1	1	JBOD, 0, 1	JBOD, 0, 1	JBOD, 0, 1	JBOD, 0, 1	JBOD, 0, 1
Total storage capacity (all bays)	4TB	4TB	4TB	4TB	4TB	4TB	4TB
WiFi support via USB dongle (Included)	✗	✗	✗	✗	✓ (✗)	✓ (✗)	✗
Interface buttons	Power button, one-touch backup	Power, one-touch backup	Power, one-touch backup, reset	Power, one-touch backup, reset	Power, one-touch backup, reset	Power, one-touch backup, reset	One-touch backup, reset
External storage support	USB mass storage, memory card reader	USB mass storage, memory card reader	USB mass storage, memory card reader	USB mass storage, memory card reader	USB mass storage, memory card reader	USB mass storage, memory card reader	USB mass storage, memory card reader
Specifications							
CPU	Not stated	Infrant IT3107	800MHz Marvell	1.2GHz Marvell	1.06GHz Marvell	376MHz Oxford	500MHz Marvell
Memory	64MB RAM / 8MB flash	256MB DDR / 64MB flash	256MB RAM / 16MB flash	512MB RAM / 16MB flash	512MB RAM / 4MB Flash	256MB RAM / 4MB flash	64MB DDR / 16MB flash
Cooling	40mm fan	60mm fan	60mm fan	70mm	70mm	70mm	60mm
Stated noise	Not stated	Not stated	Not stated	32.7dBA	24dBA	Not stated	17.7dBA
Included cables	Ethernet	Ethernet	Ethernet	Ethernet	Ethernet	Ethernet	Ethernet



KITLOG

These are our four basic systems, with something for every taste. On this page, **The Game Box** is put together with money-saving in mind, but also an eye to getting as much bang for buck. It's the best value system for those who want a lot of processing grunt, but who don't want to sacrifice the upgradeability or compatibility that is so important. Intel's going to keep the P55 socket around for quite some time, so making the leap to this new platform is well-timed.

If you're going to spend money on a beast that generates pixels, you might as well spend a little more and get a screen that shows those pixels in their best light. This screen is that beast, and the 24 inches of colour-accurate screen boast a response time that will give you each sultry frame just as the game designer or movie director intended. Definitely a toy worth saving up for.

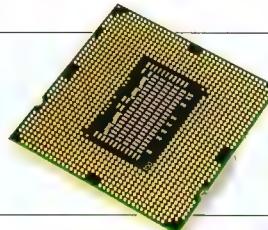


The Perfect PC, on the other hand, is the system everyone aspires to, with nothing but the best parts – without going crazy, though. It's a collection of all the greatest hardware that we'd pick without a budget, sure to impress with performance and sheer style.

Oh, and if you're wondering what the Ref IDs are, that's the ID of that article on our website. Just enter it like this – www.atomicmpc.com.au/?NUMBER – and you'll go straight to that review.

THE GAME BOX

CPU

**Intel Core i5 760**

PRICE \$245

Intel's budget quad is more than you'll need in a chip – now even faster!

MOTHERBOARD

GIGABYTE P55A-UD4

PRICE \$225

A great value P55 board with some nice features.



MEMORY

**G.Skill Ripjaws F3-10666CL7D-4GBRH**

PRICE \$130

Great value, tight timings, and some flexibility.

VIDEO CARD

NVIDIA GTX460

PRICE \$245

A reference-design card, but plenty fast for gaming bliss.
Issue 116, Page 38

THE PERFECT PC

CPU

**AMD Phenom II X6 1090T**

PRICE \$355

Six cores of high-powered processing joy.
Ref ID: 220395

MOTHERBOARD

MSI 890FXA-GD70

PRICE \$265

A high-end AMD platform with full CrossFire support, great OC'er.
Ref ID: 221656

MEMORY

**Corsair Dominator GT CMT4GX3M2A2000C8**

PRICE \$220

Red-hot memory for dual-channel speed.

VIDEO CARD

ATI 5970

PRICE \$780

A dual-cored DX11 beast, the most powerful yet.
Ref ID: 173167

For more builds check out the Kitlog E-mag at atomicmpc.com.au/kitlog

SUBTOTAL: \$1660

COOLER



CoolerMaster Hyper 212

PRICE \$45

Nice cooling for a very affordable price.

CASE



Lancool DragonLord PC-K62

PRICE \$165

Vibration damped, great cooling and sexy looks.

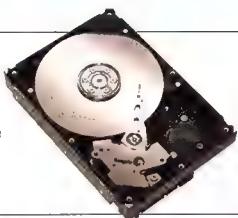
Ref ID: 160151

SYSTEM DRIVE

1TB HDD

PRICE \$90

A thousand gigabyte storage drive on the cheap.



KEYBOARD



Razer Arctosa

PRICE \$50

A cool-looking keyboard that'll serve you very well.

Ref ID: 149483

DISPLAY



Viewsonic VX2233WM

PRICE \$215

21.5 inches of value-packed screen, great buy.

Issue 108, Page 42

MOUSE



Verbatim Rapier V1

PRICE \$65

Great gaming performance and nifty features.

Issue 96, Page 43

AUDIO

Plantronics Gamecom 777

PRICE \$80

Solid set of cans with great audio.

Issue 101, Page 41



Onboard Realtek ALC889A

A decent chip that does the job.

POWER SUPPLY



OCZ ModXStream Pro 600W

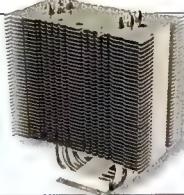
PRICE \$105

Plenty of wattage, reliable, modular for neatness.

Issue 109, Page 59

SUBTOTAL: \$4739

COOLER



Noctua NH-U12P SE2

PRICE \$95

Two fans, quiet and nice overclocking capacity.

Issue 107, Page 48

CASE



CoolerMaster ATCS 840

PRICE \$370

Heaps of fans, plenty of space, and dripping with quality.

Ref ID: 132479

SYSTEM DRIVES

OCZ Vertex 2 100GB & WD 600GB VelociRaptor

PRICE \$470 + \$400

Superfast SSD with zippy storage.

OCZ Ref ID: 219218

WD Ref ID: 220323



KEYBOARD



Microsoft Sidewinder X6

PRICE \$95

Backlit, sturdy, magnetic numpad & macro keys; what's not to like?

Ref ID: 129535

DISPLAY



Dell U2410

PRICE \$699

In-Plane Switching, 1.07 billion colours and 24 inches.

MOUSE



Microsoft Sidewinder X8 Wireless

PRICE \$105

Cable-less, comfortable, lag-free and fraggable!

Ref ID: 148422

AUDIO

Logitech Z-5500D

PRICE \$400

Earth-shakingly good.

Ref ID: 22626



Creative X-Fi Titanium HD

PRICE \$270

Seriously serious sound.

Issue 115, Page 47

POWER SUPPLY



XFX 850W

PRICE \$215

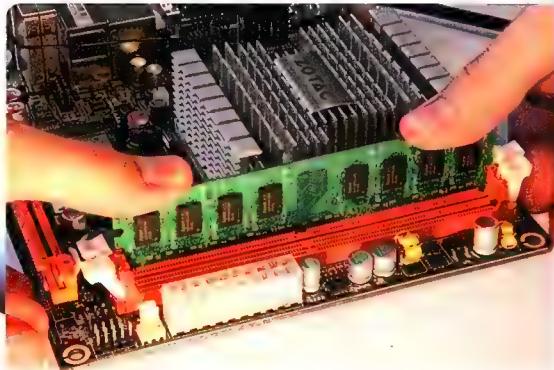
Plenty of power, ultra-stable rails and a great price.

Issue 107, Page 50

The **LAN Rig**, the ultimate in portable gaming power – go anywhere, frag anyone. No longer will you be tied to a desk or forced to awkwardly manhandle your full-sized rig, helped by a convenient handle and beefy tech. Perfect for wowing people at LANs, the tech inside is fast enough to run any game, and boasts enough speed to keep your game running at full clip even if other programs intrude in the background. After all, no-one wants to miss a headshot.

There are many benefits to running an ITX system, aside from the challenge of choosing compatible components, but here are just a few of the plusses:

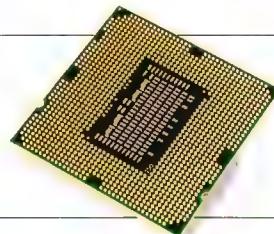
- Small footprint, so it'll fit damn near anywhere – even under a monitor.
- Lower power consumption due to restrained component choice.
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THE LAN RIG

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Intel's budget quad is more than you'll need in a chip!
Issue 106, Page 36

MOTHERBOARD

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Great overclockability,
nice value.
Issue 107, Page 40

MEMORY

**G.Skill Ripjaws 2000MHz**

PRICE \$190

Great value memory with amazing
overclocking.
Issue 106, Page 52

VIDEOCARD

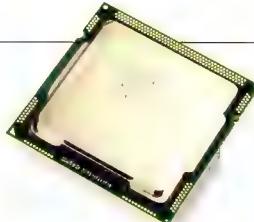
**ATI 5770**

PRICE \$190

A decent value way to get
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THE MINI

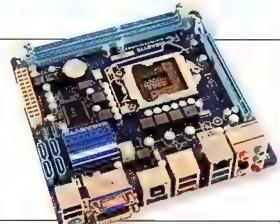
CPU

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4 storage devices. Neat.
Issue 113, Page 39

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Issue 108, Page 42

MOUSE



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Issue 96, Page 43

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Issue 101, Page 41



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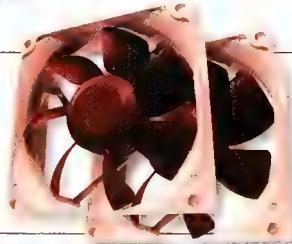
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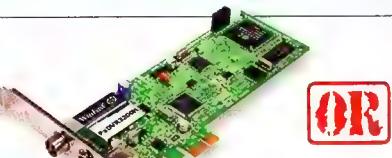
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TECHNOLOGY



Alt-t...CRASH!

Daniel Rutter has a couple of things on his mind...

Hey, gang! Let's list the things we all expect to see in a bad console-to-PC game port!

Limited graphics options, of course. Poor-to-no control configuration, too. Some idiotic checkpoint game-save system, an installer that tries to downgrade some drivers, DRM so bad you suspect it was created to promote The Pirate Bay... Oh, and no support for alt-tabbing back to Windows!

That last one's a doozy, ain't it? And the weird thing is that you don't just see it in console ports. It shows up in all sorts of games.

You know what I'm talking about. You're playing your new game, everything's great,

there'd be no excuse for a program that won't let you switch to some other program, and back.

If you're playing Peggle, alt-tab works fine. Also, probably, if you're running a 'proper' game in windowed mode. Fullscreen is a whole other story, though.

The reason for this – the reason for pretty much everything in this magazine, actually – is that modern games are the most demanding software that most PCs ever run. And big games need a lot of memory.

So when you run a standard fullscreen 3D game, Windows makes as much room for it as possible. The video-card memory that was being used for the Windows desktop, and the main

the memory with the stuff that was in it before. If it does *that*, you'll be able to continue playing.

Unless you use a DirectX function that wastes a *lot* of RAM, this data-shuffling is not easy. Especially if you've made your engine from scratch (bit.ly/gsballdtab), or licensed one that doesn't happen to support alt-tabbing.

It's always easy to tell if a game supports Interspatial Fourier-Convolution Vertices v11.3. You won't be able to tell by playing the actual game, of course, but this very important information will always be right there on the spec-sheet.

I hope, one day, to see such a spec-sheet with a "Alt-Tab Bloody Works" tick-box on it. 

...it all falls in a heap and you get a "Your program crashed, sucker!" dialogue that you can't click on because the mouse pointer is now invisible.

then someone sends you a Skype message or something and you want to reply so you pause, alt-tab to Windows, and... oh, boy. Now you're looking at a black screen, or you get to the desktop successfully but the game is now some sort of invisible window you can't switch back to. Or it all falls in a heap and you get a "Your program crashed, sucker!" dialogue that you can't click on because the mouse pointer is now invisible.

When we were playing Command & Conquer over IPX/SPX in 1996, we didn't like the fact that pressing one of those new-fangled Windows keys would freeze the game for everybody. But back then, we knew that Windows was just pretty flags and bunting hung on scaffolding made out of DOS. Lousy multitasking like this was par for the course.

Mainstream Windows flavours have been based on the DOS-free NT kernel since Win2000 came out, though. So you'd think

system memory that was keeping track of all the desktop stuff, is given to the game instead.

Pretty much everything that was running in the background is still going to be running along with the game, which is why you can receive that deadly Skype message. But the little men inside the computer whose job was making the desktop visible now all have other jobs. They are now handed 3D model and texture data, sound data, and the many other things that the game needs to have on call at a moment's notice, so your frame-rate doesn't go to hell every time you look at something new.

And then you go and press alt-tab.

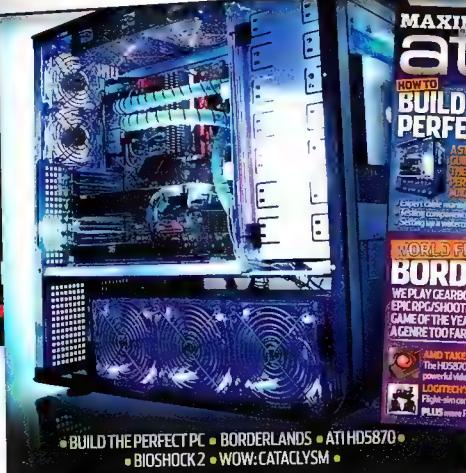
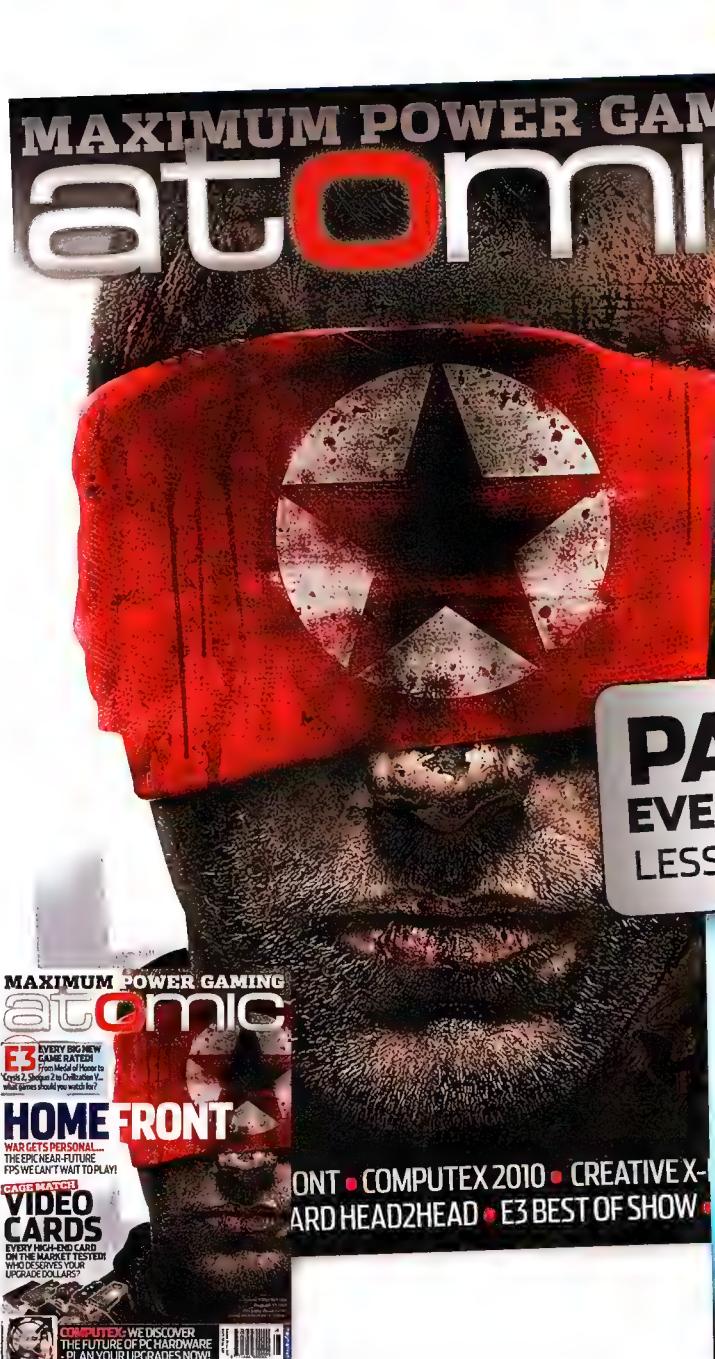
The game now has to let go of whatever precious data is taking up Windows-desktop memory. If it does that, you'll be able to switch back to the desktop. If it doesn't, it's black-screen time.

If you want to be able to alt-tab back to the game, the game has to be able to re-fill all of

Dan prefers Tab, to alt-tab.
dan@atomicmpc.com.au



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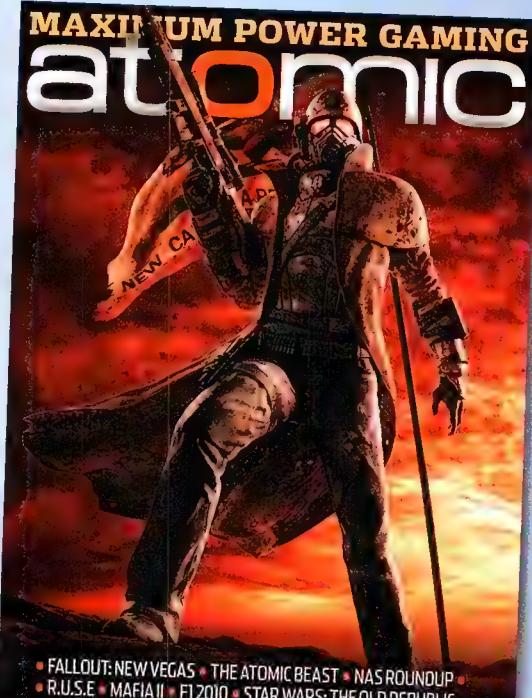
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TUTORIAL

HANDS-ON TUTORIALS FOR THE TECHNICALLY MINDED

If you're a student, chances are that this issue has landed on your desk just as things are starting to heat up, and you're probably reading it instead of doing what you should be doing: namely, studying.

Which would be why you're reading this here intro. Procrastination can lead all of us to being utterly fascinated by the most mundane of things, but it rarely leads to awesome academic performance (more's the pity).

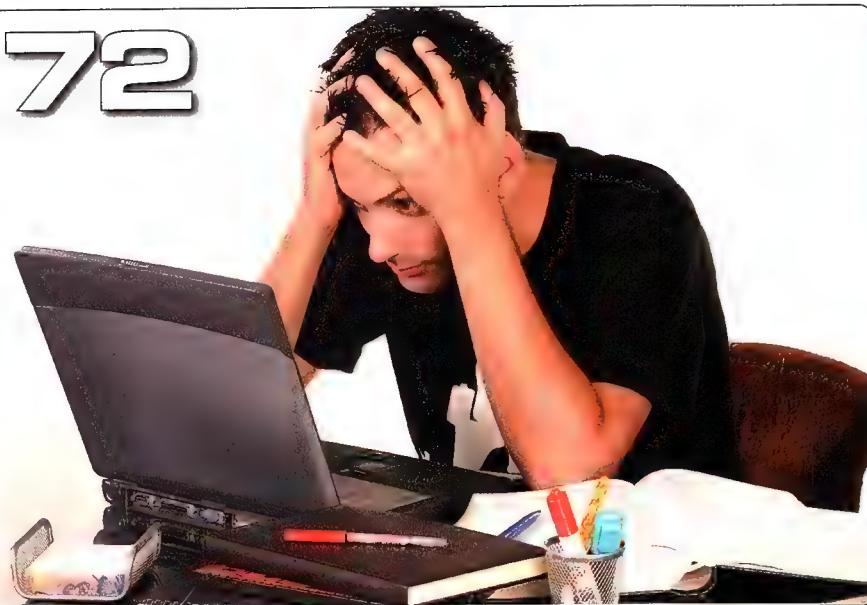
Don't despair: this month's EDU is here to help. Chris Taylor has put

together the ultimate Atomic guide to how to study for and sit in exams. He'll take you through everything from how to get the information in the first place, to how to make the best use of it during the exam, right down to making sure you have enough pens and a jacket.

It's so topical you can probably even convince yourself that reading it is an essential use of your time — at least as essential as actual study, anyway.

And if you're lucky enough to be exam-free right now ... gloat. Quietly.

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TUTORIAL CONTENTS

Atomic.edu

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Chris Taylor's compendium of helpful hints to help you survive exam and assignment hell.



WEEKLY NEWSLETTER

Keep up with the latest from Atomic!

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Assignments and exams



Chris Taylor shares how to survive the exam season.

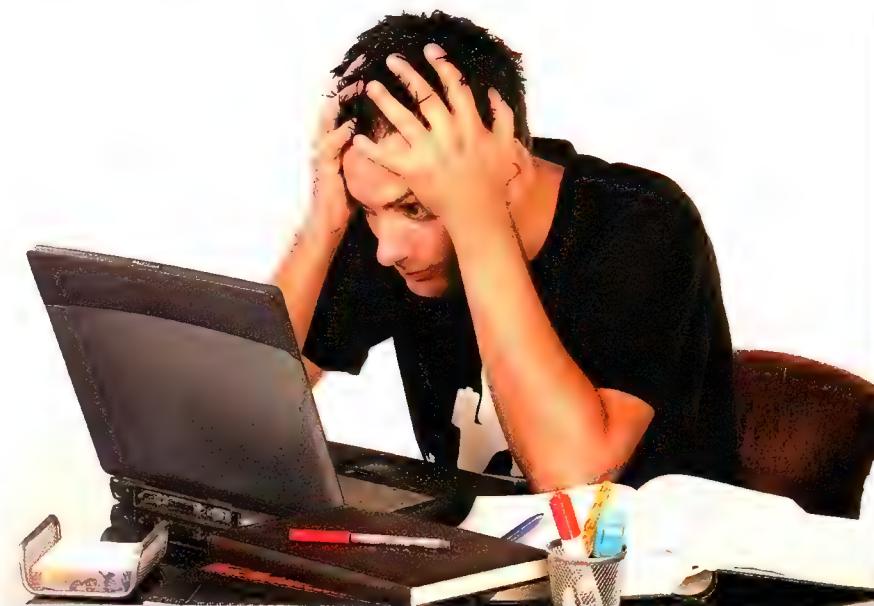
As this issue hits the shelves, some of you will be preparing for your final lot of secondary school exams. Those at university will be readying themselves for their second semester's lot of assignments and exams.

Good marks or lack thereof don't necessarily lead to real life success or failure. There are those that can talk endlessly about the theory of whatever but can't put it in to practice. Struggling with exams is no indication that you'll be a crap programmer, animator or network administrator. Nonetheless, academic success is significant. It's required to get in to university in the first place, and some degree of success is required to stay in university. And certainly you need a fairly respectable academic record if you're interested in studying more after you finish your undergraduate degree. It's necessary to have some idea of how to study effectively – and efficiently.

Preparing for assignments & exams

You hang on to old assignments and test papers, right? Good. They're one of your most useful resources when preparing for an upcoming assessment task. Look over your old work carefully. If you've consistently done well in one topic, then that topic should be a low priority when studying. If you've repeatedly performed poorly in some other area, then that area should be a high priority for you. This may involve reading material that's beyond the scope of the class if you're especially weak in one aspect of the syllabus or find the assigned material lacking. There's no point spending hours studying something you know like the back of your hand. Time management is crucial. Presumably you have other things going on in your life other than study. Even if you don't, you're probably undertaking more than a single class. You need to find balance.

The benefit of actually showing up to class eight times out of ten is that you (should) have notes. Ideally, they'll be good notes. Handwritten versions of the lecturer's PowerPoint slides are useless. When taking notes while reading or



listening to a presentation, it's worth pausing to consider whether you'll understand what the hell you're writing about a month or two from the present. Copying huge slabs of text verbatim is a bad idea but your notes must be detailed enough to be meaningful once the actual lecture or chapter is no longer fresh in your mind. Write notes in a format that is meaningful to you. You may struggle to comprehend dot points when you revisit them at a later date but easily make sense of a 'mind map' or vice versa.

Organise your notes, whether they're electronic or handwritten. Sort them by topic and/or date. If you're unable or too lazy to attend class one day, borrow someone else's notes. When it comes to studying for an assignment or exam, the benefits of being able to find everything in a single text document or exercise book are enormous. You shouldn't be wasting time sorting through towering piles of crap or a chaotic 'My Documents' directory. Incidentally, the process of rewriting your notes – even if you do it in a shortened form – is beneficial.

Some lecturers will make available exams from previous years. It's worthwhile going over these. If the lecturer makes no mention of them, ask. Head to the library as well – they usually have copies of all the old exam papers. Unless there have been major changes to the subject's syllabus in the past couple of years, you'll notice a common theme running through a lot of the questions: to the point, sometimes, where it seems the exam paper for one year is largely a reworked version of the previous year's paper, which itself is a reworked version of the year before that. In addition to seeking copies of

old or 'practice' exam papers, directly ask your lecturer or tutor what you can expect from the exam. Most will be willing to tell you that the exam paper will focus on certain areas of the syllabus or is made up primarily of a certain type of question.

Pay attention to what you're allowed to bring to exams. If you're able to bring textbooks, calculators or handwritten notes, do so, even if you don't think you'll need them. These are no substitute for actually re-familiarising yourself with the course material before the exam, but they're a good backup if you forget some critical piece of information. If you are allowed to take in handwritten notes, design them carefully. Sort the information by topic. Ensure your handwriting is legible. Write down all the formulas you might need, even if you're fairly confident that you remember them. If you're expected to draw on course readings, write down the names of a few of the theorists and works you've looked at. If you can drop a few names or maybe a smart quote (properly cited, of course) to back up your answers you'll usually get better marks. If you're allowed to bring a calculator or some other electronic device, ensure that you have a spare or freshly charged battery on hand. Bring a couple of extra pens. These things sound so simple but are vital.

Taking care of yourself is essential. Entering the exam on little sleep and a stomach full of energy drinks won't do you any favours. A good night's sleep, breakfast and a healthy alternative to shitty beverages – say, fresh fruit – will make you feel better before you even open the exam paper. Save the KFC and Red Bull for a victory



feast when you get out.

Make sure you're comfortable throughout the exam. Obviously you shouldn't be relaxed like you're enjoying an evening playing Xbox and drinking beer, but you'll struggle to focus if you're uncomfortable. Bring a bottle of water and appropriate clothing, as exam rooms are either unbelievably hot or icy cold.

Good prep is everything

When presented with an assignment or exam, the most critical step is the simplest: reading. Read the brief carefully. Ensure you know exactly what you're being asked to do. With assignments, at least, you'll usually have the opportunity to clarify ambiguously worded questions with the person who wrote them. Read the entire exam many times. Pay careful attention to use of negatives – these can throw you off and have you accidentally agreeing with something when you should be disagreeing with it – as well as black-and-white words like 'none' and 'always' and 'all'.

If there's some indication as to how the scoring is weighted – whether there's simply a note that says X per cent of the marks for the exam are awarded based on your performance in Section A or a detailed rubric – pay close attention to it. If the multiple choice questions are worth very little in comparison to the extended response section, start with the written answers.

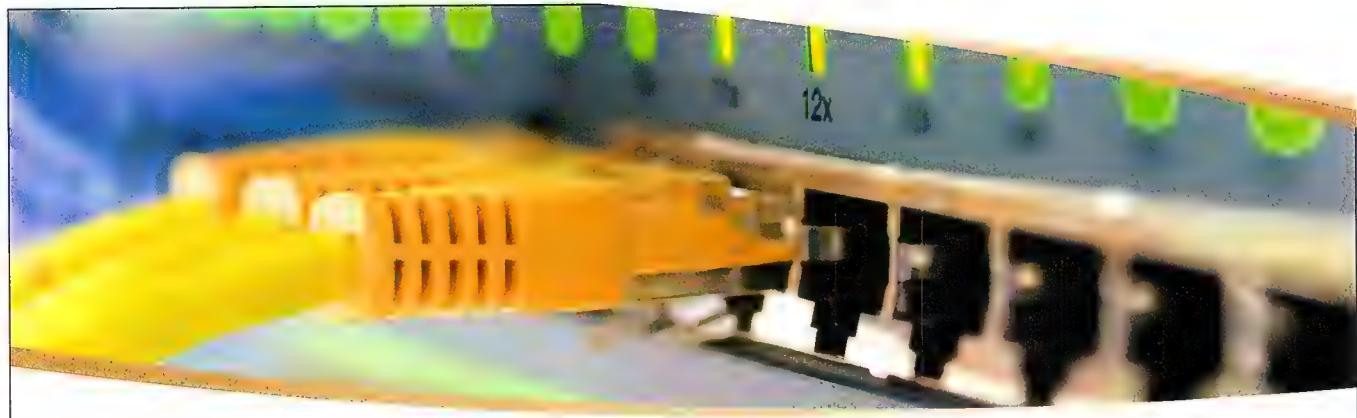


That said, don't completely overlook the stuff that's worth only a few marks. You can write the most brilliant arguments in your essay but you're not going to get a good score unless you go through and correct your spelling and grammatical errors and ensure you've cited the material you drew upon properly.

As a general rule, though, you should start with the easiest questions and work your way up to the most challenging. Even with the easier questions, the ones you could answer in your sleep, make sure you read them carefully. Poorly-worded questions can easily throw you off in

you're in a rush to knock them over so you can move on to the hard stuff.

If you genuinely don't know the answer to a question, a sensible guess is a better response than leaving it blank. Draw upon what you do know and use your common sense. Most multiple choice tests are poorly designed, meaning one or two of the possible responses can instantly be discarded if you think about the question carefully. As for questions requiring written responses, an answer that's half-way there is going to get you more marks than an answer that's non-existent. 



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GAMEPLAY

GAMES, GAMING AND FILM COVERED... ATOMIC-STYLE

Prudes be warned: what lies in the pages ahead is a veritable orgy of gaming goodness. We've reviewed, previewed and taken apart so many games this month that we couldn't actually fit them all in – which means that what you get is the cream of the crop.

First up, Ben Mansill, our go-to guy for all things racing sim, takes a look under the hood of the F1 2010, and likes what he sees (which is not Mark

Webber trying to sabotage Vettel's ride, despite what the racing tabloids may be suggesting).

Then our esteemed editor takes a trip to Germany, and Gamescom, which means previews of some of the most anticipated games of the next year, delivered fresh and piping hot.

... But that's the future. For the right now we've also sampled the cream (and not) of the current crop of releases. Read it and weep. With joy!



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Ben Mansill pops the hood and takes a look at this mighty racing sim.

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Formula 1 2010

Finally, a Formula 1 game that does justice to the ultra-high-tech sport and mindbending world of the F1 driver. Ben Mansill takes a look under the hood of racing's latest greatest game.

The evolution of racing sims has always been a steady, incremental tale of progressively stepped up graphics, plus a gimmick here and there to give a new game some point of difference. Rewinding time or boasting a billion car customising options is, sadly, the only sort of thing we can point to in recent years as 'innovations'. Big whoop. Amazing car physics were achieved early on with titles like *Grand Prix Legends* (1998), so plaudits for that these days are undeserved – as far as we should be concerned that's a minimum expectation. Massive online worlds like the imminent *Test Drive Unlimited 2* are interesting, and staggering numbers of cars in a single game (*Gran Turismo 5*) certainly deserve our respect, but represent only a massive budget and bloody hard work.

If it's a particular car or track you want, dead set cert it's been done via some mod, somewhere. So what's a dev to do to really impress? Especially when they've picked up the rights to the biggest motorsport in the whole wide world? Atomic sat down with Codemasters' F1 Supremo, Andy Gray, to lift

the lid on what is shaping up to be the most advanced racing sim ever...

Get real

F1 2010 elevates bells and whistles to a whole new level, surrounding the core driving engine

with an ultra-impressive set of features. But all that cool stuff would still fall short if the basic, fundamental feel of driving wasn't up to scratch. Behold, then, a seriously advanced mother of a sim that's set to raise the bar and do justice to the bleeding edge tech that's associated with



Formula 1 itself.

Gaining the hotly contested Formula 1 official license gifted Codemasters with access to car and track data from the teams and venues. Finding a way to actually use that data effectively, and translating it into a game that properly conveys the insane depth that is F1, proved a surprisingly happy fusion. Starting from scratch with an all-new, and humbly named 'EGO 2.0' engine, the devs worked on ways to best feed the complex and not at all game-engine-friendly team data into a game. As it turned out, Codemasters were able to create software tools that recorded and managed that data and plug it directly into the game, virtually eliminating any guesswork about how the car should handle.

As Gray explains: "We've had a staggering amount of input from all the teams, in particular



It's a hell of a comfort to know that the in-game car you're driving handles according to raw mathematical reality...

the engineers. Very early on in the project we found the data they were supplying to be incompatible with our physics model. Over time, as various physics models were rewritten to more accurately portray F1 cars, we found that we were actually starting to plug it straight into the game! Each of the cars will handle and feel slightly different depending upon the makeup and design, which is not really something that's been evident in F1 games of the past."

The devs were there during pre-season testing to sample data, including the all-important

engine sounds. It's a hell of a comfort to know that the in-game car you're driving handles according to raw mathematical reality, not some dude's rough guess, with the game engine processing actual car data in real time to give a hyper-real feel. It doesn't hurt either that the sounds are spot-on perfect for each car. Mechanical music, indeed.

CAD data for the tracks was sourced from the FIA as well as the architect plans for tracks designed in recent years where computer data was actually used. Using that

baseline foundation, tweaking was done using photography patiently accumulated by walking every track and taking shots looking forward, back, left and right every two meters. Final stage perfecting came courtesy of former F1 driver Anthony Davidson, who joined the team at the outset as a sort of 'realism consultant'. Davidson's contribution proved to be critical, lifting the detail to unheard of levels. Tiny touches like all the little bumps on a track to the slight differences in height seen in the ripple strips and more come straight from the guy with the real-world experience.

For sure, it's a driver's life

Having Davidson onboard immeasurably boosted the off-track experience, which is where the game's vast ambition shines. With the mantra "be the driver, live the life", F1 2010





puts you in the shoes of an F1 driver outside the cockpit, as well as in – capturing all the drama, politics and psychology a driver contends with through the entire race weekend. Pre and post-race press conferences, as well as impromptu media quizzing, help you steer your F1 career. Trash talking an opponent will win favour with your own team, but may jeopardise your future prospects of switching to that team later on. Who the all-important number 1 driver is inside a team depends as much on on-track performance as it does with how you handle the politics behind the scenes. Do you want to stay with a crappy team and build it and yourself up over the long haul, or play the system and go hard for a seat in a superior team?

Initially we were worried that all this would just slow down the action – we just want to race! But incredibly Codemasters has pulled it off, hauling in the amazing life of a driver into the game so it works as a cohesive whole and never feels like a fluffy hindrance.

Weather winner

By far the sexiest part of the game, though, is the total awesomeness of the weather system. Nothing in the past has come close to its sophistication, which is both a technical triumph and a key part of F1 racing strategy. Just as it is in real life racing, weather maketh the race.

Rain isn't just a layer of translucent texture and some pretty pixel shading. It's *physics*, man. Deep and dirty. Cars will progressively create a drier racing line as they go, making overtaking especially risky as you try and slip past a car that's on the dry via a slidey wet area. Areas of a track covered by trees will be drier too – neat huh?! Your tires will even wear and gain differently, depending on the track surface. It's all a recipe for gameplay strategy that's been missing from every single racing game of the past, but is probably the single biggest factor to making real world racing so thrilling.

Your team, via your radio race engineer, will be monitoring from afar, advising when it may start or stop, but it's your call what to do. Jump in a bit early to switch from slicks to wets? Or risk staying out longer? This is the excitement of F1 racing and how it affects not just a race, but potentially the championship – and now it's a key part of a game and brings with it elements that mean simply driving a hot lap is just one bit of the total experience package.

You'll never drive alone

So you're in a car that's right. You're on a track that's perfect, and you're racing in the real environmental world. But you're also part of

Nothing in the past has come close to its sophistication, which is both a technical triumph and a key part of F1 racing strategy...

Some of the all-time best races are great purely because it rained, and here we have it, finally done right. Rain does what rain does. It pools in some areas, it runs across the track, it may be heavier in one section and lighter in another, it comes and it goes, and it's only a little bit predictable.

a team, a cog in a greater machine. F1 2010 won't ever let you forget it. Besides the off-track RPGesque career gameplay, there's also a fantastic level of interaction that, again, deeply mirrors the whole set of driver inputs. That means your best mate, the Race Engineer. He'll be there when it's time to set up a car for the track, recommending setup tweaks that suit



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your individual driving style, whether it be smooth, aggro, oversteer or understeer and downforce preferences. You're free to make those adjustments yourself – and practise outside the career mode is totally open to let you get great at a track – or if you prefer, the Race Engineer will do that for you based on the result of a virtual conversation.

Some of the coolest moments in a real-life races are eavesdropping in on the radio transmissions between the driver and Race Engineer. F1 2010 covers that in depth and is far more than just a set of canned actor's lines. Dynamic radio that reflects the race as it progresses, including what they'd like you to do (but don't necessarily have to) are deeply layered. Andy told us that: "The Race Engineer feeds you all sorts of data and intel. He will talk to you about your position in the race, where your team mate and championship rival are and the condition of your car. He will also talk to you about race strategy and the weather, should it look like changing in the coming laps. We wanted to make the player feel like they are an F1 driver and having the Race Engineer as your main point of contact during the race is vital to this immersion."

A.I. that's I.

A.I. in racing games is famously shitty. More often than not your racing style is forced to compensate for how you know the A.I. will screw you over. F1 2010 promises an altogether more convincing experience. Like any licensed sport sim, how the other competitor's personalities and talents come into play is a big part of satisfying fan's expectations. According to Andy: "We have created a new A.I. system specifically for F1 that recreates the driver behaviour you see on race weekends. Some drivers will be

aggressive, some defensive, some smooth and others good/bad in wet weather. We want the player to get to know the other drivers and their personalities. For example, if they have Lewis steaming up behind them they will soon know that he'll be looking to overtake as soon as possible, whereas other drivers may play the waiting game and hope to capitalise on a simple mistake."

F1 fans know the drivers well and, as with every sport, it's all in the detail. An F1 fan expects Alonso to be an angry, passionate, ruthless bastard as much as anything less than precision perfection from Button or arsehole tactics from Schumacher would be weird if not done right. While we're unsure just how accurate the bastard factor is modelled – and Codies are far too diplomatic to shed any light on that, Andy did let slip that: "We want the AI drivers to act like their real life counterparts as much as possible. This

will affect factors such as their ability to overtake, how good they are in the rain, how they react to pressure etc... It will also affect their driving style so Jenson Button will be smooth while Lewis Hamilton is more aggressive with the car."

Concessions to fun vs realism

There's no anger, followed by sinking sadness, quite like 'coming off in a hot race when you're being a total hero. Racing game fans know it well, and it's a prick of a feeling. Time rewinding is one solution, and F1 2010 does offer that if difficulty levels are set to easy, but the hardcore won't want any of that nonsense. The issue is exacerbated by the precarious nature of F1 itself. We've all seen first corner pileups and front wings being ripped off regularly when things get up close and personal. Being an 'open wheel' formula, too, is asking for trouble, with any



Multiplayer

A sim of such quality demands that the fun be shared, and your skills thrown out there against the real world. F1 2010 supports 12 players online. That's about half what many would like, and half of what you'll see in a real race. A little disappointing, yes, but on the flipside fewer drivers mean fewer racing incident^s disasters that ruin it for everyone.

The hardcore can have a full qualifying session and full race distance, or anything up to that, while a quick blast of just a few laps is there if you want that. To keep things clean the game imposes proper rules and regulations, with associated penalties. We were happy to hear Andy explain: "We've recreated the rules of F1 in the game, so bad driving or corner cutting will result in penalties. These penalties are dictated by the race length. In a short race it will be a ten second penalty but in a longer race you will receive drive-through penalties which can pretty much wreck your race. We've also introduced a ghosting and disqualification system for if anyone is constantly griefing or doing something stupid, like driving the wrong way round the circuit."

contact likely to result in some kind of disaster.

Enforcing the F1 rules in-game helps a lot and F1 2010 will hand out time penalties and drive-throughs if you're being a dick. Other game elements have been softened a bit to compensate, and we're totally fine with that.

We asked about the front wings specifically: "I think it's fair to say that it's not as delicate as the real thing because this would perhaps be a bit too much for the majority of players. However they are still fragile. It's possible to break off the



entire wing or just sections of it. When watching races on TV you will often see drivers lose end plates, which although detrimental to the aero of the car, do not warrant a pit stop. This is recreated in game and you can minimise the effects by adjusting your wing settings on the fly by using the D-pad."

The other emotionally devastating thing that kills a good race has also been sorted. We're talking mechanical failures and once more, we're totally down with the way Codemasters has decided to handle that: "We made a gameplay decision to not include mechanical failures as for us, it's simply not fun to be out of a race when you have done nothing wrong. However if you mistreat your car you will lose performance. You only have eight engines to last the season so you have to look after them. You can also do things like overheat your brakes, cause issues with your suspension or create flat spots or graining on your tyres."

A perfect start

Off the line, F1 2010 shames previous licensed F1 games. It polishes all the usual elements and adds innovative features that are going to make racing other sims feel flat and empty. It's a multi-year license that Codemasters scored and it's important that the games reflect the crazy in and off-season developments we've seen in recent amazing years. There will be a new game each year towards the end of the season, because the developers need the year to factor in the new season's car performances and technologies, as well as any new tracks and regs.

We're excited and loving that finally there's a F1 game that's a supremely great sim, as well as being an expansive and complete game. F1 2010 is due for release in late September.



MODIFICATION

with Ashton "That's no moon.. it's a MOD!" Mills



BSG: Fleet Commander 0.5.6

Game Homeworld 2

URL www.hw2bsg.org

Mmmm... Battlestar. Tasty. The iconic re-invention-adaption-extravaganza of a series gave us a gritty, dark and yet sublime telling of the Battlestar saga, with beautiful CGI-rendered battles in space as a hallmark of the series.

How awesome it would be if you could *play* in those firefights, zipping between missiles and fending off the Cylon threat?

Now you can! And what better engine than Homeworld 2, which all but begs for a Battlestar makeover given its forte as mass-space-battle-sim of the decade.

Although only at a 0.5.6 release at the time of writing, meaning it's not complete and there's more work to do, it's hard to pass up an opportunity to see BSG come alive on screen in your hands. New models, textures, special effects and missions clock in a download of 700MB, so it's no small modification. And it not only comes with a range of missions to play, but a campaign for each side, so you can explore dishing out the goods with a Cylon baseship. Versus your friends too, if you like, given Homeworld 2's multiplayer features. If you love the resource gathering, researching tree-ing, mass fleet building and giant space battles that Homeworld 2 offered, it only gets better when you add in BSG.

BSG: Fleet Commander is available for both Windows and Mac OS X, for that single Mac gamer out there (granted, they've got Steam now, so there might be two of them). Unfortunately there's no BSG soundtrack included due to copyright, but just imagine the start theme of the show and dive in. It's BSG, nuff' said. 



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Fallout: New Vegas

Bigger, better, and a whole lot more
Vegas (baby!) than Fallout 3. Dig it, Daddio!

So you sit eight journoz and trade types down with a pristine hot-from-the-coding-team install of Fallout: New Vegas, and tell them they've got an hour to enjoy the game's beginning quests and areas. What do you get?

You get pretty much eight very different characters, eight very different stories, and a whole lot of bad guys and beasties with shredded bodies and heads – at least, that's what happened during our demo at Gamescom. New Vegas gets you into the meat of the game much faster than Fallout 3, but not without first giving you a whole lot of gritty flavour and a mess of options to get you started.

Here are our impressions of that first hour.

Ain't that a kick in the head

The opening movie tells you everything you need to know to get a feel for the précis – about the

New California Republic, their enemies "Caesar's Legion", and the situation in the free city of New Vegas. And it's a sticky situation, too. The NCR's waiting for a renewed attack from the slave-driving Legion, and given they only just held onto their prize possession – the refilled Hoover Dam – in the first attack, things are looking grim.

Grim is pretty much how things start for you, too – your hands are bound, you've apparently been captured by a local gang (the Khans – okay, we'll get it out of the way now: "Khaaan!"), and all at the behest of a well-dressed groover who's taken a special interest in your job as a courier for the Mojave Express.

And then you go and yourself shot in the head and dumped in a hole. Things can only get better from there, right?

You do wake up, thankfully, and this is where Fallout's now classic character generation system kicks in. The kindly sawbones who introduces you to the game (voiced by and looking uncannily like Battlestar Galactica's Michael Hogan) informs you that a local and rather eccentric robot found you and saved you.



You had been shot in the head, though, so the Doc provided some patching up – and he wants to make sure that you're fully healed.

What follows is a chance to change your appearance, gender and name, and go through sorting your stats and skills. The SPECIAL system returns, and you can modify stats by spending spare points to boost the ones you want. A series of questions from the Doc to make sure you're thinking straight, then you set your skills. Finally, you can choose some special abilities to get you started.

As in Fallout 3, once you leave the Doc's house in the small town of Goodsprings you have the option to review and change your stats in case you've changed your mind, but SPECIAL does a pretty good job of giving you a personalised character that suits your play style.

We let the game's decisions about our stats stick, and ended up with bit of a sneaky thief type with a penchant for energy weapons and a way with the ladies. A lot of the familiar abilities from Fallout return, by the way, with a few new





ones to make things interesting. And again, as you level, more abilities unlock.

We were a concerned that if New Vegas took as long to deliver god-awesome energy weapons as Fallout 3, we might be in trouble, but that's taken care of nicely. Doc hands back your gear, including an appropriate weapon and some ammo. It's only a beat up weapon, but it's a start.

Then we got out into the wide open wasteland.

What about the graphics?

This is about our only sore point about the game. Though New Vegas is very much a new game, not an expansion pack, the fact that it uses much the same engine, colour palette and animation system as Fallout 3 does sadly leave it looking a little dated.

Graphics engines these days move fast. What was once groundbreaking and edge-of-the-envelope stuff, like Crysis' detailed foliage, can now be seen in any number of cut-rate games. Fallout 3 isn't old, but it's old enough – in New Vegas, that really shows in the facial animations and the terrain rendering, which is looking really low-fi compared to modern games Mass Effect 2 and Mafia II.

That said this is an engine that can still deliver and incredible world experience. New Vegas features the same great draw distance and the same feeling of ever-changing terrain that Fallout 3 nailed, and that makes up for a lot. And, to be honest, there's likely quite a few hurdles yet to go before the graphics are nailed down for sure.

Plus, chances are the guys who set up the demo were erring on the side of frame-rate, rather than high settings and pretty sunsets – and fair enough. So we're hopeful, but it's still worth mentioning.

Alone... with the neon tumbleweeds

Tumbleweeds are the most recognisable staple of American deserts. Of course, in the wasteland, those tumbleweeds can be made of crackling pure radiation – but we're getting ahead of ourselves.

First things first when you get out into the town is to hook up (no, not like *that*) with local toughgirl Sunny Smiles. She, along with her pet dog, is your intro into a combat tutorial. It's pretty flavoursome, and gets you another rifle to boot, but if you're a Fallout vet, you can easily skip it.

She does point out that the local matriarch, Trudy, always likes to meet new people in town – and it seemed like the least we could do. The town did more or less save our life, after all.

And we might have been feeling a bit guilty about the Karma-loss we triggered when we stole some of Trudy's back-stock of Sarsaparilla. We're a sneaky lying thief... but we're not a complete arsehole.

So we track her down in the saloon, just as she's arguing with some jerk who who's cranky at her for hiding some guy. A very angry jerk.

Fallout: New Vegas still very much offers the players a mess of choices as to how to play the game, and this scene is a perfect example. As they were arguing, we had the opportunity to pick-pocket them – though we didn't. It would have also been possible to shoot said jerk outright just for being rude – though, again, we didn't, as we wanted to explore the story of the encounter and see where it went.



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PREVIEW



We could have also ignored the entire starting area and gotten down to investigating just why we'd been ambushed and left for dead, by heading to the nearest Mojave Express office.

What we did was interrupt the blowhard, Cobb, to see why he was so hot under the collar. Turns out he and his pals are a bunch of escaped convicts who settled in the local area, after having claimed it as theirs. A travelling trading caravan refused to pay to get past, got caught in a fight which killed most of the crew, and now the town is protecting the lone survivor.

Again, it's up to you how you go about resolving the situation – assuming you don't just say "Screw you hicks" and bugger off. You can join the convicts if you want and take over the town completely, or you can chat more to Trudy about the problem. We felt we owed the town a debt, so went the 'helping folks' route.

This led us to find this poor sucker from the caravan, the unfortunately-named Ringo,

convince him we were on his side, and then recruit various townsfolk to help. At this point your skills come into play – pointing out to some that there are god hiding spots around the town (using your sneak skill) will get them onside, while you can also call upon other skills with other townsfolk.

Once you've got everyone you think you need, you return to Ringo, and the fight with the convicts begins.

It's pretty easy, but at this stage that's probably a good thing – your gear is still pretty decrepit, and you're still pretty much a squishy newbie. If the townsfolk help out, it's even easier. When it's all over, another new part of New Vegas becomes apparent.

Your rep now works across a mess of factions. In this instance, the town of Goodsprings now think you're pretty neat, meaning you get

Super. Hard. Core.

Fallout: New Vegas introduces a funky new game mode called Hardcore.

Inspired by the many mods that add a whole mess of realistic touches to Fallout 3, Bethesda's taken the same route and offered a way to play the game that ramps up the difficulty, but promises a 'special reward' at the game's end.

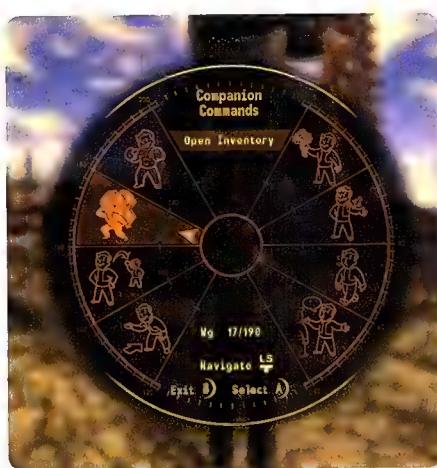
So what does 'Hardcore' mean? Well, healing and anti-rad kits have an effect over time – not instantly. This is a giant change. Where before you could suck up rads and simply counter-act it in a few seconds, in Hardcore you'll need to be aware not only of how much you're glowing in the dark, but how long it's going to take to heal.

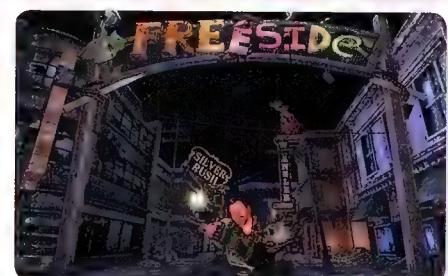
Further, incapacitated limbs can't be healed in the field. Like in real life, a bandage or stim injection ain't gonna help that flapping, broken leg.

Hardcore also introduces heavier weight penalties, especially on ammo, and the threat of dehydration out in the wastes. We don't know what the 'special reward' is, but we don't care. Real Atomicans won't even think about the decision – it's Hardcore all the way, baby!

discounts on anything you buy and a better reaction around town. Of course, the gang you've just taken down don't like you, and are going to be likely to attack on sight.

The levels of rep and infamy you get will even affect complete strangers, and further to this, wearing the appropriate gear can trigger different reactions too. We cheerfully stripped a downed





convict of his cool tire armour, only to find out that since we were affiliating with a gang, we'd likely be shot by right thinking types without a second thought.

Pretty good to know – we took off the gear before any harm could befall us, but did make out like a bandit in terms of shotgun shells and bottlecaps.

A wide open road

With the convicts dealt with, the townsfolk singing our praises, and the main story beckoning – and a Bethesda dude telling us our time was nearly up – we thought it best to hit the open road.

Out in the wastelands it's all wild animals and strange sites – interspersed with adventurers and more of that convict gang. The first adventurer we met we treated, well... we're not proud. He had cool shades and an awesome set of armour, so we sauntered away, hid behind a rock... and blew his head off.

Good thing too, really, as soon enough we found a band of those convict types – who of course didn't take kindly to meeting the guy

who'd killed their boss. But a .357 Magnum, a good sneak skill and lucky headshots saw them dealt with. Full of piss and vinegar from our victory, we continued on – and then backed the hell up.

Ahead of us, a basin, full of sinkholes, trash, and a weird glowing... well, it looked like tumbleweed, but we're thinking it's much nastier than that. Suffice to say, we didn't get close, and then, with our goal of the Mojave Express office in sight... demo over. Damn.

When you set up a time-limited demo like that, what you want from your audience – ie, the eight game journos in the room – is to leave them

wanting more. And it was a complete success; we just want more – now! We've no idea what they got up to; we glanced at some screens, and on each one it looked like a totally different game. Some were off gathering supplies and harvesting plants, others were getting attacked by wild dogs – wild dogs? We didn't see them...

But what's really telling is that we're very tempted to try and make much the same character when we do finally get full access to the final code – we'd built up that much of an attachment to the story and his part in it.

Good job, Bethesda.  DH

PC, Xbox360, PS3 (previewed on PC)

Developer Bethesda
Publisher Bethesda
Website <http://fallout.bethsoft.com/>

✓ Wide open world; faction reputation; Hardcore mode.

✗ Slightly dated graphics.

Anticipation rating
We're expecting a worthy successor to *Fallout 3*.

89%





RUSE

Has Ubisoft gone just a bridge far enough?

You've seen those classic war movies – the ones where pipe-smoking Officers stand around a huge map table and push around blocks of wood to represent the movements of their troops. Ubisoft takes that classic symbolism to a new extreme with RUSE; a technologically brilliant title.

We're just not sure about the game itself...

Jerry's attacking here...

RUSE features a mess of playing options, from the Campaign that'll take you through most of the great American-fought theatres of the war, to online co-op and competitive play. You can set up standalone games against what Ubisoft calls the "RUSE AI", and each game type can, in turn, be tweaked to generate the play-style you're looking for; from the period of the war, to game speed and AI strength and personality.

But the true star of RUSE is the Eugen Engine.

We mentioned the classic map-table schtick of classic war movies earlier – that's exactly what you're playing at in RUSE. At the game's maximum zoom each game-map is laid out on a wooden trestle table in a war-room, with units represented by stacks of counters slowly moving around a map.

Zoom in, however, and the map starts to come smoothly alive. The terrain takes on depth, and units start to resolve into infantry and

vehicles. Get lower and the full size of a squad can be seen, individual members scrambling amongst the burnt out buildings of a town, while in the distance a dust-storm hazes the area.

It's a brilliantly executed mechanic, and one that on top graphical settings will push most machines – even our 4870X2 had trouble keeping the frames running smoothly, and RUSE's in-game benchmark tool only delivered about 16fps on our test rig.

(Note to self: must run this title on the Atomic Beast. Now.)

The Eugen engine is seriously beefy, capable of rendering serious detail across an entire theatre of operations – zoom in close on a tank battle and you'll see vehicles rocking on their tracks from impacts, and flames shooting up from near-dead vehicles. Artillery craters the

ground, and fires break out in forests and built-up areas following intense fighting.

But that's the thing the thing... the actual fighting in RUSE is some of the most idiosyncratic we've ever seen in a historical wargame.

A bridge too far?

At its heart, RUSE is a very broad wargame of the old school. Sure, the RUSE elements add an interesting layer to the game, but without all the high-tech trappings of a modern wargame, RUSE feels a little... old.

There's absolutely no sense of units interacting with the battlefield, for instance. They don't use cover or buildings, and have no real sense of individuality. Tanks have no armour facings, and air combat is heavily abstracted.

A lot of this is on purpose – a commander at





that level rarely worries about such minutiae – but it does leave the actual combat element of the game a little flat and flavourless.

We like the ruses, though. You can decrypt enemy communications to know unit intentions and movements, hide your buildings or build decoy ones, boost your troops' fighting abilities and so on. We suspect there's a lot of depth in this system of simple combat mechanics combined with high-level strategic decisions – but it's going to take a while to learn.

It doesn't help that the single-player AI is an awkward combination of single-minded ruthlessness and vague incompetence. In our one-off AI match-ups we were universally outclassed – it really feels as though your enemy, lacking the necessity to use something as gauche as keystrokes, has a huge advantage. In the campaign, however, we were able to beat one mission by simply setting up a good anti-tank defense with close infantry support and making a cup of coffee – the AI sent in the same combination of one infantry unit and two tanks every 60 seconds without fail. They died each time! All we had to do was rack up points to win.

Sure, that might be the feel of real high-level combat (Dwight D. Eisenhower, who gave the go-command for D-Day, didn't have much to do after that), but it's not much of a game.

And RUSE's unique take on base-building and resources is another learning curve to get over. In the campaigns, base-building's a bit haphazard, but it's a fully-blown feature of the multiplayer game.

You need to build supply depots on supply points scattered around the map to get resource



points – each depot is finite, too, so you can't just sit on one. Then you need to build buildings to produce units: barracks for infantry, airfields for planes and so on. You can also build up defensive works like gun emplacements, but one interesting touch is that all of these must be linked by road – this makes transport networks vital, and given that supplies are trucked back to your base, interdicting those supply lines is a perfectly valid tactic.

But that's just one of many, and in no other strategy game is divining your opponent's intent (and hiding your own) more important. It's great to see this new layer of gameplay, but it does come with a caveat – again, it's that learning

curve. It's very easy to be totally bushwhacked by a clever enemy using the right combination of ruses and the appropriate build orders.

It's like getting Zerg-rushed while blindfolded.

RUSE is almost too interesting to judge just yet – the game's going to require a lot of learning and dedication to master. And, to be perfectly honest, we're not sure that what we're seeing even is hidden depth, rather that muddled gameplay. We're going to have to give this game a lot more time before a truly final verdict, but for now, here's our cautious judgement – get it, but be very sure you're willing to put in the effort this game is going to require. **DH** 



PC

Developer Eugen Systems
Publisher Ubisoft
Website www.rusegame.com

Gameplay
Curiously retro but challenging nonetheless.

Graphics
Amongst the best game engines in its class.

Sound
Nothing particularly noteworthy.

79

92

75

Overall
A tough game to really grok, but worth trying.



82%



Mafia II

Can this gangster epic match up to its not so hidden inspirations? We think it can...

Mafia II is a game that feels so familiar. There you are, playing a game, feeling like you have agency in the remarkably well-drawn world that it offers, and then... you make a dumb decision. You, the player, knows it's a dumb decision; it's likely, too, that the character you play, Vito Scaletta, knows it's a dumb decision. His family would certainly call it so, as would most normal people.

The only person in the game for whom it makes perfect sense is Vito's pal, Joe, who's hardly a model for a good life.

But that's the brilliance of Mafia II in a nutshell. It's a game set on solid moral rails - and getting to the story's end is still an incredible journey.

You can't refuse...

As review copies of Mafia II started to filter around, one refrain was commonly heard - please, they pleaded to reviewers, don't compare us to Grand Theft Auto! It's a fair call, because the comparison could be a harsh one.

Mafia II is a big open world, full of crimes to commit, cars to steal, random crazy things to do, and liberal amounts of pissing off the local constabulary. Like any big open world game, it's

the kind of title where, rather than simply quit when you want to stop playing, you can simply do something highly illegal and see how many police cars you can get coming after you. However, where that could easily describe the entire reason to log onto a GTA game, it really misses the point of Mafia II.

This is a game about story, about the arc of a young man who has been found wanting, been given the chance to redeem himself, and still finds himself drawn into a life of crime. And for all of GTA's brilliance, it never tells such a sad and inevitable tale as Mafia II.

But the truly remarkable thing about M2 is that it never feels derivative or cheap - even when it's directly quoting from the great films that have

inspired it. Games like EA's The Godfather 2 managed to get in actors like Robert Duvall to voice their characters from the film, but it still felt like a cheap adaptation of the genre to a medium that simply didn't suit.

M2, to make a comparison to a comparison, feels more like comparing Goodfellas to anything that Francis Coppola made - there's no point, because both take that same material and make something remarkable.

And the game?

Yeah, we're talking a lot about imponderables like story and genre. In terms of gameplay, the trick that developer 2K has pulled off is that they have made a game that's almost a cookie cutter of GTA.





You're stealing cars, buying suits, avoiding getting arrested, taking on missions, doing the odd side mission, collecting stuff and... you get the idea. But M2 has some very clever, very evocative tricks up its sleeve.

As a perfect case in point, early on in the game you're told by your mother to get an honest job at the docks, where your father worked. You give it a red hot go, even though it's obvious the place is fiendishly corrupt. Your mission, Vito? To pack crates on a truck.

Push a button to pick up a crate, then maneuver that crate onto a truck, and push a button to load it. It's boring as hell, really true grinding, but after the first crate a dialogue pops up along the lines of "ditch this nowhere job and leave whenever you want".

If you know anything about games you can

probably guess that's going to trigger a new event, but the thing is you can keep loading – and we did! We toted at least four more loads before admitting we'd had it. That's a great piece of video game theory right there – of course we're going to ditch the boring stuff. But we also knew that we were giving up our last chance of honest work.

At its best, that's exactly the kind of game design that makes Mafia II such a gem.

But...

But.

There's always a but, just like when a Mafia Don gives you some kind of Devil's choice.

For all the great mission design and remarkably clever decisions 'forced' upon you, there's a tiny drawback. For instance, let's look at the driving.

Seasons play a huge part in the game. When you get back to your fictional home town of Empire Bay from WWII, it's Winter. It's a cold, slippery time. It's also the early 40s – cars really suck! They handle like hippos in a current, and on ice it's even worse. And it's icy all the time in the early game. But it makes sense for the story, because – even though years pass – the next phase of the story really fits spring. But those early stages are a real effort.

A lot of it's to do with the deliberately story-focused thrust of the game – you do a lot of driving, and it's not that exciting. Even your no-good pal Joe complains when you run a red light, and the fact that doing so near a cop can lead to a chase gets old a little too fast. There's a real sense of being forced to admire the storytelling going on.

But for all of that M2 hits its mark more than it misses. Gunplay is satisfying and diverse, the lockpicking mechanic's actually easier than it looks and rewards clever thinking, and nailing a handbrake turn, on ice, tailed by cops, and getting away... when it works you feel great.

... this offer

Mafia II hits its mark, no mistake. Tellingly, it's the rare modern game that doesn't offer multiplayer – because it's not about open mayhem or kill-counts.

This is a game that unapologetically wants to tell you a story. It wants you to realise the futility of the gangster lifestyle while reveling in its excess and larger-than-life trappings. The PRs are right – it's a waste of time to compare Mafia II to GTA.

One of them's pure entertainment, the other a great example of game-based story-telling. And gaming is better for both of them. **DH** 

PC, Xbox 360, PS3 (reviewed on PC)

Developer 2K Czech
Publisher 2K Games
Website www.mafia2game.com/

Gameplay

Too much driving, but otherwise solid mechanics and storytelling.

Graphics

Draw-in issues mar an otherwise fine engine.

Sound

Good voice-work and excellent music.

93

86

94

Overall

An epic crime tale worth the telling.

90%





Has IO Interactive learnt from the mistakes of the first Kane & Lynch?

Kane & Lynch started earning a bad rep even before most people had played the original game. This is the title that famously saw a Gamespot reviewer lose his job over a negative write-up – which was posted at the same time that Atari was dropping a mess of cash on a site-wide K&L advertising campaign.

The bad press of that debacle aside, it also just wasn't very good on its own terms. For as much as it really wanted to be the gaming equivalent of a slick heist film, its muddy controls, second-rate graphics and generally unlikeable characters made it a hard game to spend time with.

With a Metacritic rating of just 67 and a user-rating of even less, you could be forgiven for thinking that developer IO Interactive would turn to another IP.

And you'd be dead wrong.

This time for sure

This time our two sociopathic anti-heroes are in neon-lit, rain-drenched Shanghai, performing a piece of contract work for a mysterious criminal overlord called Glazer. It's all very ultra-noir, and more or less impenetrable. What's more, the

plot gets seriously muddled early on when you – or, more accurately, your partner Kane – kills a young girl involved with local gang syndicates.

Essentially, what the game devolves into is 'You and your buddy versus the worst that Shanghai can throw at you.' And by worst, we mean more mooks than you can poke a high-calibre stick at and the odd torture session.

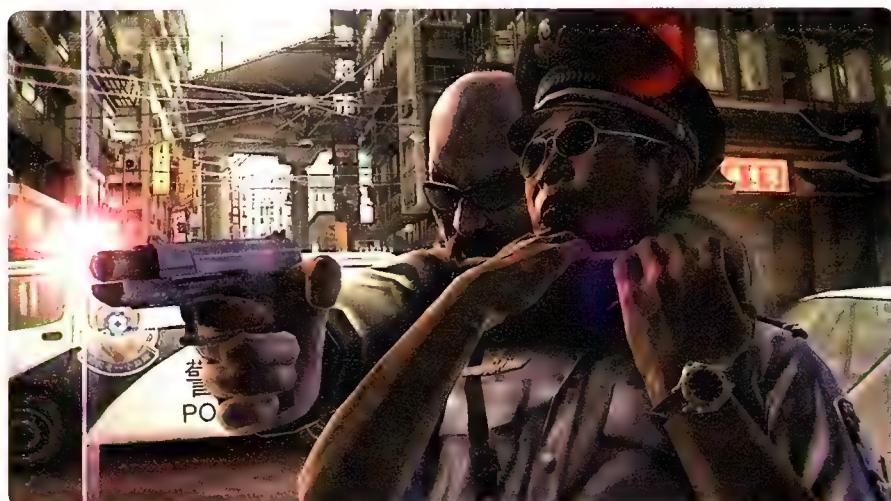
There is a great story here, truth be told, but it may not be a great *gaming* story. It's simply not... fun enough! We like our bleak entertainment as much as the next guy, but this goes beyond the pale.

The first issue is that this time around you're in the shoes of admitted psychopath Lynch instead of the slightly more likeable Kane. This means

you're an angry, paunchy, balding white dude. Who likes to wear sweat-stained t-shirts. And seems to be going out with a young Asian girl approximately half his age.

It's several flavours of dodgy, but that's who you're going to be playing as, so you better get used to it.

You'll also need to get use to IO Interactive's documentary-inspired graphics. And we're talking handi-cam, hand-held level of documentary here, with zero ability to compensate for lighting conditions or focus. It's a brave move, but like many brave moves executed by those who should know better, it only ends in serious injury – though in this case it's not the devs getting hurt, but you, the gamer,





as you get fatal levels of eye-strain.

Seriously, the game looks terrible. Colours wash out, every texture pixelates like you're watching a TV crime report (an effect that is at times used on purpose, but is more often than not simply an engine failure), and so-called lens flares and light blooms simply make it look like you've spilt flavoured milk on your monitor.

Sure, IO may be keeping the Glacier Engine up to date, but the engine's age is really starting to show. What's more, despite there being full AA and anisotropic filtering options, most characters end up with a jagged black halo surrounding them. The whole look of the game is a slap in the (strained) eye of anyone with a high-end video card.

But we'd forgive all that if the game were actually fun to play, with the promised intense shoot-outs and precise controls.

Just f**king die already

Kane & Lynch 2 features some pretty adult language. These are hard, criminal men – career recidivists who don't care who they offend. They'll say 'fuck' to a priest and pistol-whip

anyone who talks back.

And so will you, after experiencing the ballistics engine in this game.

It's a third person shooter, of course, but that's no excuse for this level of floppy controls and poor mechanics. Sure, you can reliably draw a bead on the enemy, but there's every likelihood that no matter how many blood sprites you see, they'll still be standing. Conversely, near misses can often be just as fatal as headshots. Go figure.

Combined with a control scheme that's going to see you running into a lot of door jambs, our frustration levels often saw us simply rage-quitting in favour of another turn or ten of Civ V. At least that game has a proper save system, not the seemingly arbitrary one of K&L2. We don't mind replaying sections of a game if they're good, but having to replay entire stretches of K&L2 is some kind of special hell.

Probably the hell for gamers who swear a lot at priests.

Yes, the multiplayer portion of the game has some truly unique game modes that are all about trust and betrayal and yadda yadda yadda, but you're still stuck with the same poor graphics and loose ballistics. What's more, the higher health counts of actual player characters makes

the weak ballistics even more of a liability. It's entirely possible to empty an assault rifle clip at someone and still have them able to draw a bead on you.

Not worth the pain

And yet, despite all of this, we still laud the actual characters and concept of the game. Every now and then you can see exactly the kind of experience that IO Interactive was aiming for – but like the first time, the company's very wide of the mark. The voice acting is great, and the art direction – despite the poor game engine – fantastic.

But they are highpoints that are ultimately wasted on Kane & Lynch 2. **DH** 

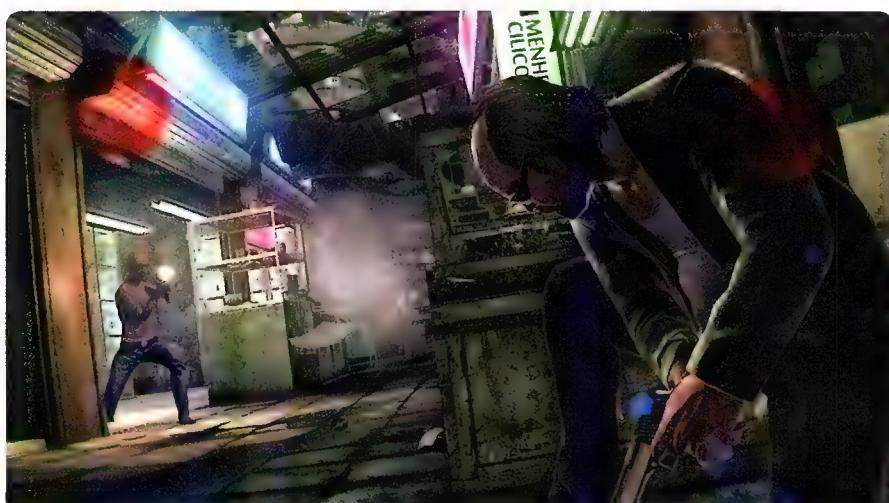
PC, Xbox 360, PS3 (reviewed on PC)

Developer IO Interactive
Publisher Namco Bandai
Website www.kaneandlynch.com

Gameplay
Poor ballistics, dodgy controls... meh.

Graphics
For 'documentary', read 'crap'.

Sound
The best thing about the game.





Sniper: Ghost Warrior

A highly detailed game that still manages to miss the most important element – fun.

Before we get into the meat of this review – which is largely a bile-filled rant about less-than-perfect games – there's an admission we must make.

We're pro-sniping. We're the kind of gamer that gets called a camper (and often much worse) because if a game developer gives us a precision shooting tool and good places to use it... we're going to do it. It's a valid tactic, and our standard response to anyone sick of getting head-shotted for the fifth time in a row as they try and take the central flag in *clod_donner* (hey, we're old school) is that they might want to go play *Risk* or *Tetris* if they'd rather play something where getting shot is the *whole damn point*. But we digress.

So, all that said, you'd think then that a game that has as its central premise would be like .50 calibre ammunition from heaven.

Yeah, we'd like to think that too...

High hopes dashed

So here's the game's premise: you're a member of an elite spec-ops team (the Ghost Warriors) who specialise in small unit actions, such as sneaking into the jungles of a third world country and helping overthrow a military dictator through

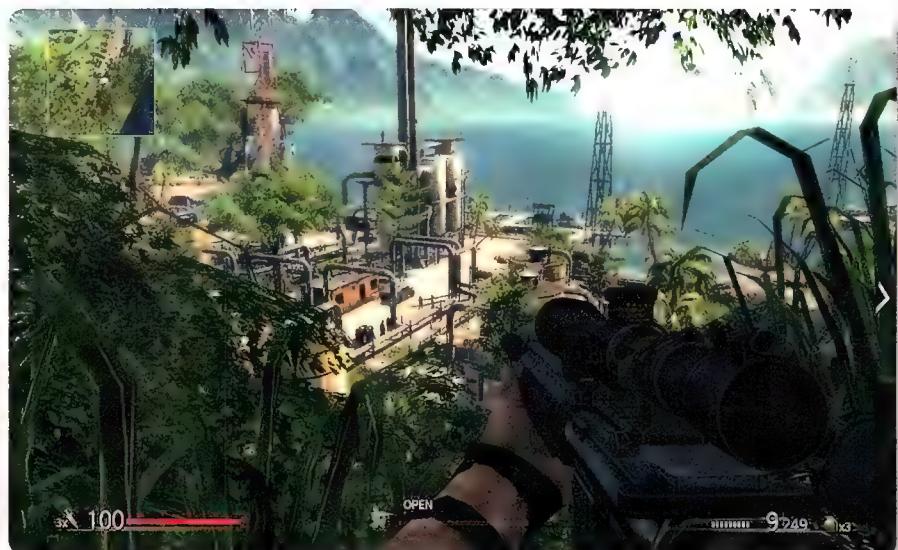
the use of well-applied headshots. It's nothing new in gaming, the kind of thing we've been getting comfortable with since *Rainbow Six*, but the execution in this instance starts off flawed and gets progressively worse.

First up, if any government (and we can only assume this is a US government operation) wanted rid of a troublesome regime so badly... they wouldn't use a sniper. Sure, some of the game highlights the need to train up locals and support their insurgency in more traditional engagements, but snipers aren't used like this any more – this is why we have *Predator* drones, after all.

It might seem a mighty small bone to pick but the thing is, when a game prides itself on incredible realism, it is making a claim it had better back up across the entire gameplay experience, not just in one mechanic.

But instead of a full military intervention, or CIA-style backroom deals and 'material support' we get the more heroic Hollywood take – lone men in the jungle in half-baked ghilli suits, delivering kills at a range that hardly require a BB gun, let alone a fully-trained sniper.

Even worse than that kind of setup are the contrived plot-hooks and surprises every other level. It's typified by the your first assignment, a





military strong-man caricature with a penchant for cigars. You sneak through the guards, get to your roost (or 'sniping spot' as the poor script puts it), and take your shot. Bang, you say.

However, at this exact moment, for no readily apparent reason, a nearby fuel pipeline blows up, knocking down your opponent before your round strikes. The entire level is thus designed so that the badguy can make a clean getaway.

Don't even get us started on the fucked-up explosion physics in this either. Sheesh!

Fall of shot

Like we said, the actual sniping is pretty involving. Gunfire effects are deep and rewarding, and the ballistics of the game quite detailed – you've got wind shear, fall of shot, and all kinds of variables to keep in mind when you're in-scope. In Normal difficulty, you get a small addition to your targeting reticule that depicts where each round is actually going to land, but on higher difficulty you've got to figure all of this yourself, making for some very satisfying kills.

And speaking of which, while we're not usually a fan of fancy kill-cameras, it's pretty neat getting a slow-motion shot of your round impacting skull every time you make a headshot. Combined with

a solid set of rag-doll physics, these are some of the best kills we've had in gaming (aside from the aforementioned *dod_donne* whiner-sniping). However, this can be quite annoying when you're lining up for two kills – say two guards having a chat – you need to take the body-shot the first, otherwise the kill-cam seriously throws off your rhythm on the second shot.

Sadly, that's just one of the flaws that detract from the sniping. Poor AI design and buggy scripted events combine to make for some supremely confusing situations. Trigger an enemy too early, and it won't show up as a bad guy at all on either your mini-map, or as a glowing figure through your scope. You may end up mistaking them for random allies – until they shoot you.

The AI level also seems to drop and increase wildly depending on the kind of level you're being presented with. If it's a level where the game wants you to snipe, it's not unlike shooting at kids as they step off the short bus. If it's a more stealth-oriented level, then suddenly their intelligence and perception skyrockets so that they can shoot you from across the map without you even know they exist. To say it's frustrating gives actual frustrating games a bad name.

And a poor server too

The one saving grace of a game like *Sniper: Ghost Warrior* is that it might be fun when you take the AI out of equation. But that doesn't really change the fact this is a poorly made game that most people don't want to play – so good luck finding a server that can come close to filling any of the six 12-person maps on offer.

Yeah... 12 player maps. How quaint.

Of course, even if you could, server support is... lacking. And since the single-player ties in to the server functions, guess what happens when the server's down? No game!

There really is little reason to even try and make up excuses for *Sniper*. It plays at being a triple-A title, but only comes off as an M-grade Modern Warfare clone with a few unique tricks up its ghillie suit sleeve. If you're a serious sniping freak, you'll probably glean a few ergs of entertainment from it, but otherwise it's best left to its spiral into the EB remainder bin – though again, only if you're exceptionally keen. DH



PC, Xbox 360 (reviewed on PC)

Developer City Interactive
Publisher City Interactive (distributed by AFA)
Website www.sniperghostwarrior.com

Gameplay

Buggy, far-fetched and largely more effort than it's worth.

Graphics

Suitably lush, and worthy of a better title.

Sound

Tortured thriller-techno. Kill us now.

41

78

67

51%



Star Wars: The Old Republic

A long time ago in a galaxy... you know the rest. But can BioWare's MMO live up to that magic line?

At long last, we've gotten a brief hands on session with one of the most anticipated games of this young century.

Yes – we've played The Old Republic MMO. It's an odd bird, this game. BioWare, who can seemingly do no wrong (though, as time goes on we're more and more convinced that Dragon Age wasn't as good as first thought...), have repeatedly said this is a new kind of MMO – one that places you firmly at the heart of your very own story.

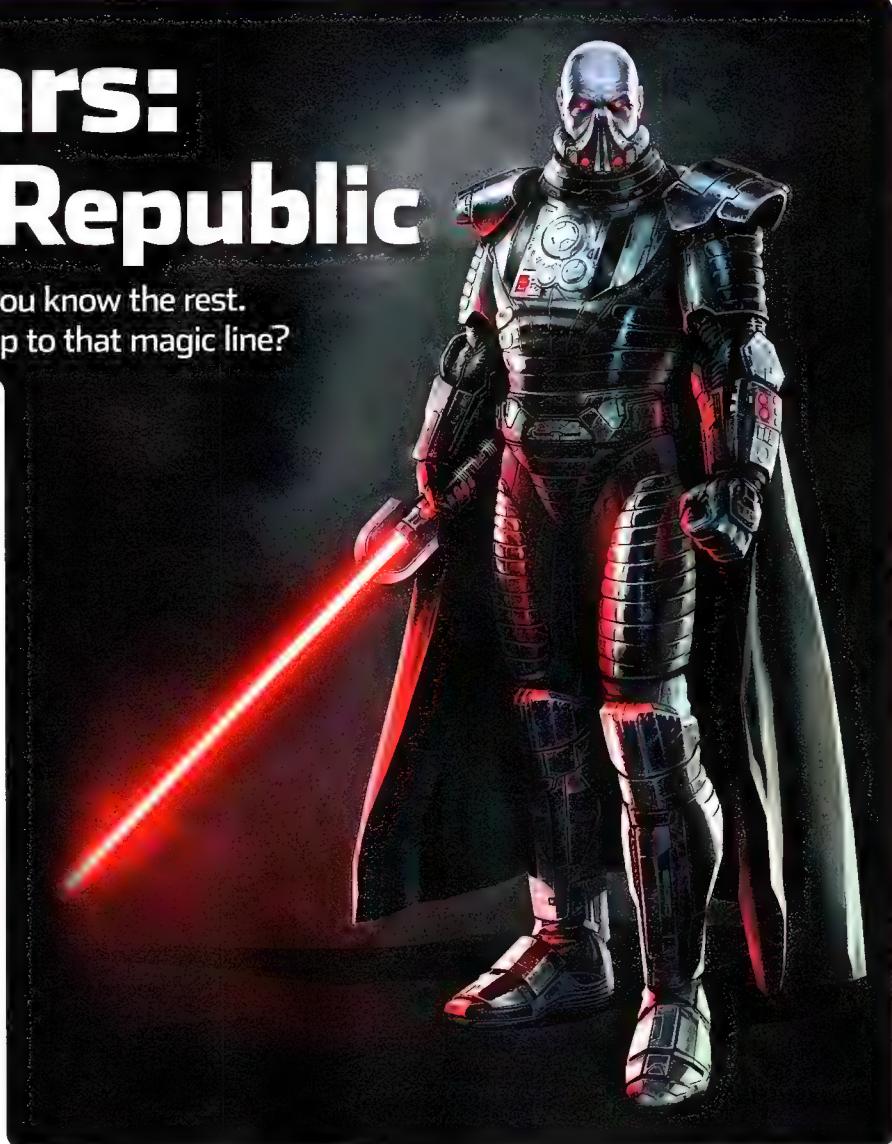
It's a common complaint about the genre – sure, you have this huge open world and thousands of people in it, but nothing you do really makes an impact. No matter how many times you storm Ice Crown Citadel, the baddies are always going to respawn so someone else can do it again.

But a world with truly persistent outcomes, where baddies stay dead and no one ever does the same quest twice, is near impossible with the current level of game design. So, with this limitation in mind, what is BioWare's take on this seemingly insurmountable MMO problem?

Star Wars meets Mass Effect

Well, the truth is that BioWare's in much the same boat as any other MMO. You and every other schmuck take the same quests as everyone else. But what BioWare has done to make your take on each quest unique is to introduce each one in a totally different way.

First up, *everything* is voiced – each NPC, each quest giver, each character. Secondly, each time you click on a quest giver you get an in-engine cut-scene, complete with dialogue options.



So, while everyone who plays the right portions of the game will have to go kill X for Y, each player will at least get a much more personalised version of that quest. Some of it goes pretty deep, too – in some instances you can even choose to kill your quest giver in a fit of rage!

Though we assume that's only a Sith option...

These choices can have a cascading effect on how your character progresses through the game, too. We've not seen yet how deep this effect is, but it's easy to imagine that it can change the way certain factions react to you later on in the narrative. What it does do is give you another quite unique way to bring individuality to your character, always a welcome thing in any MMO, and make each run through a quest chain a little-bit different.

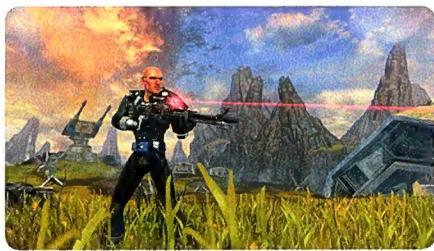
It might even get you more phat lewts.

But the real neat thing about this dialogue system is that it works in party-based quests, too. Star Wars (the original trilogy, anyway) is known for the witty banter of the heroes, and The Old Republic nails that mark too. An entire dialogue tree is open to all players to choose from, so as different players respond to each other, the encounter itself plays out. It's a nice touch that the roleplayers amongst us will really dig.

Sizzle-KRAK-voo-oom

Of course, all the great dialogue in the world won't save a game with shitty combat. Thankfully, The Old Republic's looking and feeling solid on that front too.

For our hands-on session we got the choice to play as Sith, an Imperial Agent, a Smuggler, a



Soldier, or a Bounty Hunter. Being the shameless Han Solo fans that we are, we went Smuggler. But we had another reason, too – we really wanted to try out The Old Republic's cover system.

Essentially, both the Agent and Smuggler are rogue-type classes – good DPSers with a bit of crowd-control but without the ability to soak up damage. Their schtick, however, is cover. Whenever you select an enemy, any nearby points of cover highlight with a green silhouette. As you get closer to these points, you can use your cover ability to stick to it. When in cover you take less damage, and open up new combat options which often lead to causing more damage.

It's already working really well, and while it's not as intuitive or fluid as a fully-fledged terrain and ballistics physics engine, it really gives a different feel compared to most MMOs. When in a party, Smugglers scurry into cover as the heavier combat types start opening up or force-leaping into combat – but then they start laying down serious fire and popping the odd stun grenade for crowd control. As a fight progresses these smugglers move from cover to cover, often delivering decisive firepower. They'll be the perfect class for keeping waves of mobs off tanks and healers.

Trash mobs are also light enough on HP that you never feel as though you're in the midst of an un-Star-Wars slugging match. Most mobs of your level go down after a few shots – this is a fast paced game about being outnumbered and taking on overwhelming odds.

The Dark Side

So we're really looking forward to seeing more of The Old Republic – it's looking like BioWare is going to be able to deliver on pretty much all its promises. That said, there's a couple of things we're not sure about in terms of the game's setting.

If there's one serious critique you can make the most recent Star Wars films (and let's be honest – there's much more than one) it's that Lucas made the universe smaller. We saw the same planets, even some of the same characters, and suddenly what was once a vast vibrant place became smaller, and less interesting.

There's something similar in the setting The Old Republic. Even though it's set thousands of years before the earliest films, everything looks eerily familiar. The Old Republic comic-book series, and indeed KOTOR, went to great lengths to establish a unique yet identifiably Star Wars feel. The Old Republic, on the other hand, seems to be



playing off established designs. The Sith are often referred to as Imperials, and their naval officers look uncannily like Imperial Navy officers from the original trilogy – even down to the caps.

BioWare is obviously trying to appeal to a broader and more casual market with The Old Republic, but we can't help but think this detracts a little from what made its previous Star Wars games so interesting. But that's MMOs for you – you want that larger market to pull in credits. Regardless, it's an admittedly small gripe, and it's not really impacting just how quickly we want early 2011 – when the game releases – to come around.  DH

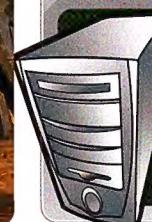


PC

Developer BioWare
Publisher LucasArts
Website www.swtor.com

✓ Interactive dialogue; fully voiced; unique MMO combat

✗ Revisionist backstory; wasn't allowed to play Jedi at Gamescom :/



Anticipation rating
World of Warcraft is looking a little dreary now...

89%

Master of Orion

For whom does the MOO toll? It tolls for thee, Ben Mansill!

My Steam account tells me how many hours I've spent playing the various games I own. Sometimes it's an alarming amount of time; almost always ten times what I'd have guessed before looking. Every time I do look, I give small thanks that such information isn't available for the game I've played more than any other, where many hours were played – must be several thousand hours.

Wonder, wonderful hours, deep within the solar reaches of *Master of Orion*?

It all started with *Civilization*, and the super addictive 4X formula. Though 4X is these days most commonly saved for space games, Civ and its like were most certainly the original 4X games, where the aim is to 'explore, expand, exploit and exterminate'. Civ was a megahit and spawned a family of similar games released under the *Microprose* umbrella. One such classic was *Master of Magic*, released in 1994, which was 'Civ with spells' and remains today an old-time game that's begging for a reboot. A company called Simtex was behind *Master of Magic* and there was no doubt they had a deft touch for the 4X genre. Indeed, I contend that Simtex did more to foster the love that exists today for 4X than any other developer.

A year earlier, though, Simtex had released *Master of Orion*, the original, and it was awesome. At the time it felt like an especially deep and complex game. Indeed it was – for the time. Compared to today's ultra-complex strategy game mechanics *MOO* is a cakewalk, but back in the early 90s it was a major leap forward. It was a grown-ups game. A serious interface with stats and reports, it was a game that adults could enjoy without feeling any loss of overall personal seriousness. It was probably the first game described as a 'spreadsheet dressed up as a game'.

At its fundamental core it was, though, super simple, and a game that very much appealed to people who like order and carefully measured progression. A starmap showed a galaxy that ranged in size between small handfuls to several dozen stars, depending on how you'd set the game parameters. You and up to 10 other AI alien races each start out with a single occupied home system; you're sporting no technology, no fleet and a crappy economy. By the end of the game you'll have explored outwards, turning the starmap your own race's colour as you expand into enemy and unknown territory. Planets are exploited and developed to contribute to the war machine, the economy and ongoing scientific research, eventually exterminated as your galactic rule is one of destruction, though assimilation is there as an inefficient and boring option.

God it was good. The real anal-retentive

inside us all (well, many of us) leapt in joy as the ever-growing economy was managed to within a credit of its super-efficient life. This was a game that you could play perfectly. Or at least, you could try to. Despite my thousands of hours of effort, it never quite went to script. You could understand the AI and what worked, but the game always surprised with curveballs and invariably the ongoing inter-AI conflicts created a storyboard of galactic drama, as alliances were made, pacts formed and diplomacy slowly became less effective as the momentum of a well-developed game left combat as the only practical strategy.

Being turn based, you'd fret over the smallest details and decisions before hitting 'turn'. Is my income growing or declining? Can I afford to build some ships, and if I do should I wait until I research longer ranged drives or better weapons? It was a joyful and perilous headache every turn.

There was blaster action, too. Through the game you'd be designing ships from components you'd researched, and each was your very own original creation. This is one big reason why I loved the *MOO* more than Civ. It really did make you feel like you were winning because you were clever and brilliant and strategic, as opposed to racing towards unalterable Battleships and Fighters in Civ.

When fleets collided a new game mechanic took over, giving you control over every ship in the battle, scooting them around in a turn-based plot of broadsides and attrition. Just playing a battle could take hours in itself, and a full game

of MOO or MOO2 could comfortably take from Friday night through to Sunday night, pretty much non-stop. This is how I spent many/most of my weekends in the late 90s. It was awesome.

If you've played it, or *MOO2*, you're sitting there nodding your head, perhaps thinking about where the damn disc is so you can have another blast. But if this is all sounding like a boring game you're not interested in, I really really (really) think you should take a look. Good Old Games (www.gog.com) has both *MOO* games for six US bucks. Combined. If you're not familiar with the wonderful GoG – they're a bunch of enthusiasts that take the time to modify old PC games so they'll run under current operating systems. Really cool guys, with an ever-growing library of classics to shop for, and some sort of petition or poll about what game they should tackle next going on. So, get it and have a go, it's great. Probably a perfect Netbook game, I reckon.

Oh and don't even think about *MOO3*, which is quite possibly the worst sequel of all time...



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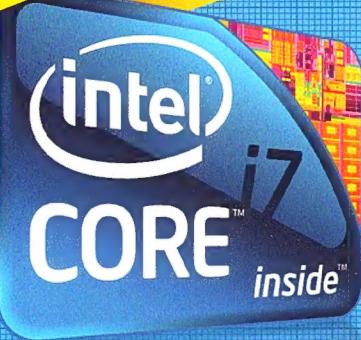
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- **Dual ATI® Radeon® HD 5970 2GB GDDR5 (CrossFire)**
- 240GB (2x120GB SSD in RAID 0)
- 2TB of Additional Storage (2x1TB in RAID 0)
- Blu-ray/DVD±RW Combo Drive
- 7.1-Channel High Definition Audio
- Dual Gigabit LAN
- Corsair® Obsidian 800D Case
- Corsair® 1000 Watt Modular Power Supply

► "This system may well be the best and fastest...in the world."

March 2009, PC Authority

► "It's nice to know that such power has been invented."

February 2009, APC Magazine

► "if you need absolute pants-soiling performance and you need it now, then look no further."

March 2009, PC PowerPlay

Altech Computers recommends Intel® Core™ Processors



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